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Household food insecurity and food safety knowledge, attitude, and practice of mothers with outpatient under-five children at Cure Hospital, Addis Ababa

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ABSTRACT: Foodborne illnesses result in life-threatening conditions among vulnerable members of households. Proper knowledge, attitude and practices in food safety issues are important to curb the damage caused by these illnesses at household level. This study examined the food insecurity experiences and food safety knowledge, attitude, and practice (KAP) of mothers having outpatient children in Cure Hospital, Addis Ababa, Ethiopia. A sample size of 210 randomly selected mothers was considered for this study. A cross-sectional study was carried out using semi-structured questionnaire to collect data on food insecurity experiences and food safety knowledge, attitude and practice of respondents. Data was analyzed using descriptive statistics. Most respondents were married (68%), had primary or secondary level education (62%), had one or two under-five children (71%), and 52% had monthly income between ETB 500 and 2500. Between 70% and 80% of the respondents experienced anxiety or uncertainty of not having enough food for household members or reduced quality or quantity of food they ate in the previous thirty days. Around 58% experienced hunger during the same period. The knowledge of mothers in food safety (food handling, personal hygiene and water sanitation) was generally poor (<60%). The level of positive attitudes of mothers towards food safety was also poor (<60%). Appropriate practices, particularly in food handling and personal hygiene were also very poor. As foodborne illnesses can be fatal to vulnerable members of a household, a thorough training to mothers in food safety issues is recommended.

Keywords/Phrases: Food insecurity experience, food safety, knowledge, attitude, practice

INTRODUCTION

According to FAO (2019), food security is said to exist when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. It is recently declared that "there is no food security without food safety (FAO, 2019). Safe food is, thus, an important component of food security and can be guaranteed through food safety measures.

Disease causing microbes that cause diarrhea are mainly transmitted through food (Lorenzo *et al.*, 2018). About 1.6 million child deaths each year are due to diarrhea (Manetu *et al.*, 2021). Diarrheal disease are the major causes of death to under-five children in low-income countries. Persistent diarrhea in under-five children results in malnutrition which, in turn, weakens the immune system and puts infants at high risk of diarrhea with increased severity (Walsona and Berkley 2018). This is commonly known as the 'diarrhea-malnutrition-diarrhea' vicious cycle. This cycle is usually caused by poor food safety practices, influenced by knowledge and attitudes of household food handlers (Akabanda *et al.* 2017). Food safety is, thus, getting more attention worldwide as there is a strong association between food and health. In fact, FAO declared that there could be no food security without food safety (FAO, 2019).

Viruses, bacteria, and parasites pose the greatest share of preventable foodborne threats (FANTA, 2015). The main reservoirs for diarrhea-causing microbes in the environment are domestic animals, rats and mice, and humans. Contaminated hands and water transmit harmful microbes to food (FANTA, 2015) where they multiply and reach dangerous levels. It is crucial to keep food free from harmful microbes emanating from feces to prevent the transmission of disease (Curtis *et al.* 2011).

The most critical actions at household level to avoid foodborne illness in Ethiopia or other developing countries are cooking at adequate temperature/time combination, decreasing the time food is stored at temperatures that favor bacterial multiplication, and reheating left-over foods at adequate temperature/time combination. Moreover, frequent handwashing

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with soap and water during food preparation, using of clean utensils to prepare food, storing food at sufficiently low temperatures to control bacterial multiplication are important food safety measures to adhere to.

Food safety knowledge, attitude, and practice (KAP) study is conducted to collect information on what is known (knowledge), what is thought or believed (attitudes), and what is done (practices) about household food safety (Mohd and Malik, 2017). Food safety KAP in food insecure households in Ethiopia is generally poor (Abaya Alemu and Mogessie Ashenafi**, 2022;** Selamawit Negash et. al. 2022; Fasil Tarekegn and Mogessie Ashenafi. 2021). The aim of this study is, therefore, to assess the food security status and food safety KAP of mothers having outpatient under-five children in Cure Hospital, Addis Ababa, Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study was carried out at Cure International Hospital in Addis Ababa. The hospital is a charity pediatric orthopedic training hospital that provides sophisticated modern medical and surgical care to physically disabled children. It is located in the Sidist Kilo area neighboring Hamle 16 public park

Sampling technique and sample size

Samples for the study were randomly selected from mothers of under-five years old children at Cure Hospital. The sample size was calculated based on a simple proportionality formula developed by Yamane (1967). As 3000 patients are treated per month, the sample size was therefore determined using the following formula:

Sample size (n) = $N / (1 + N(e)^2)$

Sample size (n) = $3000/(1 + 300(0.07)^2) = 210$

Data collection techniques and tools

Quantitative and qualitative data were collected using semi-structured questionnaires in the form of interviews. Data on sociodemographic status of respondents, household food insecurity experience and KAP in food safety issues were collected from the mothers.

Technique of data analysis

The Household Food Insecurity Access was measured according to Coates *et al.,* (2007) using a set of nine questions related to three different domains of food insecurity access: (i) anxiety and uncertainty about the household food supply; (ii) insufficient quality in terms of variety and preferences of the type of food and (iii) insufficient food intake in terms of reducing the quantity of food and lack of food for household consumption (hunger). Assessment on KAP was based on the FAOs guidelines on food safety and nutrition (Macías and Glasauer, 2014) in food handling, personal hygiene, and water and sanitation. Data were converted to percentages and used as indicators for food safety KAP. The food safety KAP of food handlers was classified, using Bloom's cut-off points for KAP studies, as good (≥80%), moderate (60%-79%) and poor (<60%) (Zelalem Destaw *et al*., 2021).

Total KAP percentage among respondents was calculated as in Macías and Glasauer (2014):

$$\%\ knowledge = \frac{Sum\ of\ correct\ response\ given\ by\ all\ responsents}{Sum\ of\ all\ responses\ given\ by\ all\ respondents} x100$$

$$\%\ positive\ attitude = \frac{Sum\ of\ positive\ response\ given\ by\ all\ responsents}{Sum\ of\ all\ responses\ given\ by\ all\ respondents} x100$$

$$\%\ practice = \frac{Sum\ of\ appropriateresponse\ given\ by\ all\ responsents}{Sum\ of\ all\ responses\ given\ by\ all\ respondents} x100$$

Ethical considerations

The management of Cure Hospital was informed of the research objective and permission to conduct the study was granted. The purpose of the study and its objectives were explained to each respondent and oral consent was obtained from them. Confidentiality of information and anonymity of respondents were maintained.

RESULTS AND DISCUSSION

Sociodemographic status or respondents

About 85% of the respondent mothers in this study were between 18 and 40 years old (Table 1). The majority were married (68%), had primary or secondary level education (62%), and were involved in agriculture or private business (65%). Number of children in a household ranged from one to more than four and most households (71%) had one or two under-five children. Most of the households (54%) had monthly income between ETB 500 and 2500 (USD 1=ETB 40, during the study period (2020/21).

Table 1. Socio-demographic status of mothers/caregivers (n=210).

Variables	Category	Frequency (n)	Percent (%)
Age group	18-31	109	51.9
(Mother)	21-40	69	32.9
	41-50	22	10.5
	>50	10	4.9
Marital status of mothers	Married	143	68
	Divorced	31	14.8
	Widowed	22	10.5
Religion	Orthodox	106	51.7
	Protestant	46	22.4
	Muslim	28	13.7
	Catholic	15	7.3
	Other	10	4.9
Education	Writing and reading	19	9.0
	1-8 Grade	89	42.4
	9-12 Grade	46	21.9
	Diploma and above	56	26.7
Occupation	Agriculture	46	22.8
	Private	86	42.6
	Safety net jobs*	14	6.9
	Housewife	23	11.4
	Daily labor	33	16.3
Monthly Income in birr	500-1500	47	23.2
	1501-2500	63	31.0
	>2501	93	45.8
Number of children	1	94	44.8
	2	54	25.7
	3	30	14.3
	>4	32	15.2
Age of children in years	1	27	12.9
	2	53	25.2
	3	42	20.0
	4	50	23.8
	5	38	18.1

** Safety net jobs are government-sponsored and consist of solid waste cleaning, urban beautification and watershed development*

Food insecurity experience of respondents

Respondents had various food insecurity experiences ranging from anxiety and uncertainty to hunger at different levels (Table 2). Food Insecurity is usually associated with depression, anxiety, and stress (Wolfson *et al*., 2021; Sundermeir *et al*., 2021). About 38.2% of respondents faced anxiety and uncertainty in the previous 30 days of the study three to ten times. A study from Egypt on food insecure households showed that symptoms of anxiety were common among food-insecure mothers (Mahfouz *et al*., 2021). About 71% had to reduce the quality or quantity of the food they ate by not eating the food they preferred to, or by limiting the variety of food they ate or by having to eat the food they did not like to at various frequencies because of lack of resources. Quantity of food was reduced by eating small portions or reducing the frequency of meals. Compromising quality of food and reducing meal frequency are among the coping strategies practiced by food insecure households (Garumma Tolu., 2018). About 58% of respondents reported that they had experienced hunger at varying frequencies during the previous month. Hunger is a commonly recognized extreme situation and the most severe level of food insecurity (Saint Ville *et al*., 2019).

Table 1. Mean values of food insecurity experiences of mothers (n=210) in the past four weeks.

		Frequency		
Household food insecurity experience	Occurrence	Rarely	Sometimes	Often
Anxiety and uncertainty	165 (80.1%)	57 (34.5%)	63 (38.2%)	45 (27.3%)
Reduced quality of food	150 (71.4%)	56 (37.3%)	51 (34%)	43 (28.7%)
Reduced quantity of food	152 (72.4%)	42 (27.6%)	68 (42.8%)	42 (27.6%)
Hunger	121 (57.6%)	56 (46.3%)	39 (32.2%)	26 (21.5%)

Rarely (1 or 2 times); sometimes (3 to 10 times); Often (more than 10 times) Coates et al., (2007)

KAP of respondents on food safety

Household food safety refers to the conditions and practices, at household level, that prevent food contamination and foodborne illnesses which range from diarrhea to severe organ damage (De Zylva *et al.,* 2020). Food safety assessment in this study included food handling, personal hygiene and household water and sanitation.

Respondents KAP on food handling

Food handling knowledge of respondents was assessed in terms of cooking food thoroughly, storing food at cool places, handling left-overfood and washing raw fruits and vegetables before consumption. Knowledge of respondents in food handling was generally poor (55.3%) (Table 3). Although respondents' knowledge in washing raw fruits and vegetables was good, knowledge with respect to handling and storing left-over and perishable foods was poor. Raw and cooked foods must be kept well separated to avoid contamination of cooked foods from raw foods, and perishable or left-over foods must be stored at low temperatures to avoid multiplication of microbes to a hazardous level (WHO, 2006)

Respondents' attitude in food handling was evaluated with respect to perceived susceptibility to diseases from eating contaminated foods, benefits of cold storage of perishable foods or re-heating left-over foods for consumption, and difficulty in cold storing or re-heating such foods. In general, positive attitude towards food handling was approached moderate level (59.3%).

Food handling practice of respondents was examined with respect to cleaning kitchen surfaces and utensils, and cold storing perishable foods. Despite the moderate attitude respondents manifested, practice in food handling was very poor (25%).

Unlike the poor knowledge level observed in our study (53%), a higher proportion of food handling mothers in Lebanon (El-Haddad *et al*., 2020) and Debarq, Ethiopia (Henok Dagne *et al*., 2019) had good knowledge in food handling. Knowledge level was, however, only satisfactory among food handling rural women in Egypt (El-Mezayen *et al.,* 2020) and Bangladesh (Mendagudali *et al*., 2016). Similar to our observations, poor food handling practice was also reported from Northwest Ethiopia (HenokDagne *et al*., 2019) and Egypt (El-Mezayen *et al*., 2020). Moderate positive attitude towards safe handling of food was observed in our study. Good level of positive attitude was also reported from Lebanon (El-Haddad *et al*., 2020) and Bangladesh (Mendagudali *et al.,* 2016).

Table 3. Respondents KAP in food handling (n=210)

Food Handling Knowledge	
Reason for separation of raw and cooked foods	109 (51.9%)
Signs of thorough cooking of soups and stews for safety and readiness to be served	144 (68.6%)
Kinds of perishable foods to be stored in the refrigerator or a cool place	100 (47.6%)
Reasons for avoiding eating leftovers that were not kept in a cool place	75 (24.9%)
Washing raw fruits and vegetables before eating	175 (83.3%)
Average total knowledge	**55.3%**
Food handling attitude	
Perceived susceptibility to and seriousness of disease from eating contaminated food	103 (49%)
Perceived benefits of keeping perishable or cooked food in a cool place; re-heating left-over before eating or serving them	162 (77.1%)
Difficulty of keeping perishable or cooked foods in a cool place; reheating left-over foods before eating or serving them	109 (51.9%)
Average total positive attitude	**59.3%**
Food handling appropriate practice	
Usual cleaning of kitchen surfaces and utensils after preparing dinner	53 (25.2%)
Storing perishable fresh foods such as raw meat, poultry, and fish	52(24.8%)
Average total food handling appropriate practice	**25%**

Respondents KAP in personal hygiene

Microbes that cause foodborne illnesses can be found even in healthy people. Everyone can spread disease causing germs from oneself to food if one touches the nose, mouth, skin, hair or clothes, and then food (Bintsis, 2017). Good personal hygiene can prevent illness that comes from eating contaminated food.

Knowledge in personal hygiene was assessed in terms of prevention of fecal germs from contaminating food and key moments of washing hands during food handling. Disease-causing germs can be found everywhere,

particularly in soil, water, animals and people. Hands and kitchen utensils carry these microbes, and when these come in contact with foods, they can be cause for foodborne diseases (WHO, 2006). Respondent mothers in our study had poor knowledge (28.3%) in appropriate hygienic practices (Table 4).

Table 4. Respondents KAP in personal hygiene (n=210).

Personal hygiene Knowledge	Know
Action to prevent food poisoning from germs from feces	85 (40.4%)
Key moments of hand washing	34 (16.1%)
Average total knowledge	**28.3%**
Personal hygiene positive attitude	
Susceptibility to or severity of stomach ache or diarrhea from not washing hands	111 (52.9%)
Benefit of washing one's hands before preparing food or before eating or feeding a child	145 (69.1%)
Difficulty ofwashing one's hands before preparing food or before eating or feeding a child	123 (58.6%)
Confidence in washing one's hands properly	89 (42.3%)
Average total positive attitude	**55.7%**
Personal hygiene appropriate practice	
Step-by-step description of hand washing	55 (26.2%)
Average total food handling appropriate practice	**26.2%**

Attitude of respondents to personal hygiene was evaluated in terms of susceptibility to disease from not washing hands or severity of diarrhea to oneself or to one's child; difficulty in washing one's hands before food preparation or feeding a child; and confidence in washing one's hands before feeding oneself or one's child (Table 4). Positive attitude of responding mothers to personal hygiene was also poor (55.7%). Appropriate practice in personal hygiene was evaluated with respect to step-by-step description of handwashing, which was found to be very poor (26.2%).

In general, although positive attitude level was much higher than knowledge and practice levels, KAP in personal hygiene among our responding mothers was poor. Other studies reported good knowledge level but poor levels of positive attitude and appropriate practice among mothers in Wondogenet, Ethiopia (Assefa Demssie *et al*,, 2017); good levels of knowledge, positive attitude and appropriate practice in Nigerian mothers (Ogwezzy-Ndisika and Solomon, 2019); and good level of positive attitude but poor levels of knowledge and appropriate practice among mothers in Senegal (Ju *et al*., 2020).

Respondents KAP in household water sanitation

Earlier methods on water safety focused mainly on sources of water collection. Along with provision of water to communities, however, household water quality can be improved by simple, low cost, physical and chemical treatment methods, together with safe collection, handling and storage of water (Nath *et al*., 2006).

Table 5. Respondents KAP in household water sanitation (n=210)

Water sanitation Knowledge	Know
Treating unsafe water	28 (13.3%)
Average total knowledge	**13.3%**
Water sanitation positive attitude	
Susceptibility to or severity of stomach ache or diarrhea from using unsafe water	112 (53,3%)
Benefit of boiling water before drinking or using it	133 (63.3%)
Difficulty ofboiling water before drinking or using it	87 (41.4%)
Confidence in boiling water before drinking or using it	87 (41.4%
Average total positive attitude	**49.9%**
Water sanitation appropriate practice	
Collect water for domestic use	188 (89.5%)
Treat collection item to make them clean	207 (98.6%)
How water is stored	57 (27.1%)
Treat water to make it safe to drink	125 (59.5%)
Actions to make water safer to drink	34 (16.2%)
Average total water sanitation appropriate practice	**58.2%**

The importance of household water sanitation has been stressed by previous studies which showed that drinking water, obtained from safe sources, might become contaminated during

storage in the house (Jensen *et al*., 2002); significant contamination occurred after water was collected from safe source (Clasen and Bastable, 2003) and even the collected safe water was subjected to fecal contamination at household level (Wright *et al*. 2004). It is, thus, important, to clean water storage containers.

Knowledge in household water sanitation in this study was evaluated with respect to the different treatment methods of unsafe water to make it safe. Our respondent's knowledge about the various methods that can make water safe for consumption was very poor (13.3%). Similarly, attitude towards treating unsafe water was (49.9%) or practice of household water treatment (58.2%) was not satisfactory either (Table 5).

Poor knowledge and practice of household water treatment was also observed from Nigeria (Ibrahim *et al*., 2017) and Malawi (Bennett *et al*., 2018). An analysis based on a national data from Ethiopia showed that less than 10% of the population treated water prior to drinking (Abraham Geremew *et al*., 2018). However, studies from Benin (Amoukpo *et al*., 2018) showed good level of knowledge inand positive attitude towards water treatment at household level. A high proportion of households also showed good level of KAP in water treatment in India (Solanki and Amaliyar, 2019).

CONCLUSION AND RECOMMENDATIONS

Based on Bloom's cut-off point for KAP studies, this study showed that knowledge, attitude and practice of our respondents in food safety issues were far from desirable. The fact that about 50% or slightly more households had almost moderate level of positive attitude towards all food safety issues indicated that appropriate awareness creation in food handling and personal hygiene could improve the food safety situation in households. As foodborne illnesses are life-threatening to vulnerable members of households, it is recommended that health extension workers stress on food safety issues during health education to households.

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Annex 1. Household Food Insecurity Access Scale (HFIAS) in the past four weeks

HFIAS conditions	Occurrence Yes (%)	No (%)	Frequency* I No (%)	II No (%)	III No (%)
In the past four weeks, did you worry that your household would not have enough food?	165 (80.1)	41 (19.9)	57 (27.7)	63 (30.6)	45 (21.8)
In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	146 (70.1)	62 (29.8)	72 (34.6)	39 (18.8)	35 (16.8)
In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	154 (73.7)	55 (26.3)	53 (25.4)	68 (32.5)	33 (15.8)
In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	151 (74.4)	52 ()25.6	44 (21.7)	47 (23.2)	60 (29.6)
In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	151 (74.4)	52 (25.6)	44 (21.7)	68 (33.5)	39 (19.2)
In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	152 (74.9)	51 (25.1)	40 (19.7)	67 (33.0)	45 (22.2)
In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	135 (67.5)	65 (32.5)	64 (32.0)	41 (20.5)	30 (15.0)
In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	128 (74.0)	72 (36.0)	53 (26.5)	50 (25.0)	25 (12.5)
In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	101 (51.3)	96 (48.7)	50 (25.4)	27 (13.7)	24 (12.2)

**I, Rarely (one or two times); II, Sometimes (three to ten times); III, Often (more than ten days)*

Annex 2a. Respondents' knowledge in food handling (n=210)

Knowledge items	Frequency
1: Reason for separation of raw and cooked foods	
¨ Raw animal foods often contain germs	109 (51.9%)
¨ Other	44 (21.1%)
¨ Don't know	57 (27.3%)
2: Signs of thorough cooking of soups and stews for safety and readiness to be served	
¨ They are boiling/ well cooked	144 (68.6%)
¨ Other	34 (16.3 %)
¨ Don't know	32 (15.3%)
3: Kinds of perishable foods to be stored in the refrigerator or a cool place	
Meat, offal	33 (15.9%)
Poultry	8 (3.9%)
Fish	14 (6.8%)
Foods from the sea or lake	7 (3.4%)
Milk/dairy products	9 (4.3%)
Cooked foods	27 (13.0%)
Other	4 (1.9%)
all	100 (47.6%)
4: Reasons for avoiding eating leftovers that were not kept in a cool place	
Because food is not safe anymore	84 (40%)
Foods get spoiled	59 (28.1%)
Higher temperatures make germs grow faster	14 (6.7%)
Other	22 (10.6%)
Don't know	31 (14.9%)
5: Washing raw fruits and vegetables before eating	
¨ Wash them with clean water	175 (83.3%)
¨ Other	18 (8.9%)
¨ Don't know	17 (8.4%)
Total knowledge	**55.3%**

Annex 2b. Respondents' attitude towards food handling (n=210)

Food handling attitude	It is	It is not	Not sure
Perceived susceptibility: Likelihood of getting sick from eating contaminated food?	112(53.6 %)	18(8.6%)	80 (38.1%)
Perceived severity: Seriousness of getting sick from eating contaminated food.	93(44.3%)	51 (24.4%)	66 (31.6%)
Perceived benefits: Goodness of keeping meat, poultry, fish, or cooked food in a cool place.	124(59%)	21 (10%)	65 (31%)
Perceived barriers; Difficulty of keeping these foods in a cool box or the refrigerator.	48 (22.9%)[4]	132 (62.9%)	30 (14.2%)
Perceived benefits: Goodness of re-heating left-over before eating or serving them	201 (95.7%)	7 (3.3%)[5]	2 (1%)
Perceived barriers; Difficulty of re-heating leftovers before eating or serving them	67(31.9 %)[6]	86(41%)	57 (27.1%)
Total attitude	**51.2%**	**25%**	**23.8%**

Annex 2c. Respondents' practice in food handling

Food handling appropriate practice	No (%)
1. Usual cleaning of kitchen surfaces and utensils after preparing dinner	
¨ Scrape excess food into a rubbish bin	75 (35.7%)
¨ Wash with hot water	73 (34.8%)
¨ Wash with detergent	53 (25.2%)
¨ Don't know/no answer	9 (4.3%)
2. Storing perishable fresh foods such as raw meat, poultry, and seafood	
¨ In the refrigerator (below 5 °C)/cool box	63 (30.0%)
¨ Covered (protected from insects, rodents, pests, and dust)	96 (45.7%)
¨ Separated from cooked or ready-to-eat foods	32 (15.2%)
¨ Other/ Don't know	19 (9.0%)
Total practice	**25%**

Annex 3a. Respondents' knowledge in personal hygiene

Personal Hygiene Knowledge	No. (%)
1. Action for preventing food poisoning from germs from feces	
¨ Wash hands (after going to the toilet and cleaning the baby's bottom)	126 (60%)
¨ Remove feces from the home and surroundings	59 (28.1%)
- Other	15 (7.1 %)
- No answer	8 (3.8 %)
2. Key moments for hand washing	
¨ After going to the toilet/latrine	87 (41.4%)
¨ After cleaning the baby's bottom/ changing a baby's nappy	41 (19%)
¨ Before preparing/handling food	40 (19%)
¨ Before feeding a child/eating	29 (13.8 %)
¨ After handling raw food	3 (1.4%)
¨ After handling garbage	4 (1.9 %)
- Other	2(0.9%)
- No answer	2(0.9%)
Total knowledge	16.1%

Annex 3b. Respondents' attitude towards personal hygiene

Personal Hygiene Attitude	It is	It is not	Not sure
Perceived susceptibility: Likelihood of oneself or child having stomach ache or diarrhea, from not washing your hands.	109 (51.9%)	30 (14.3%)	71 (33.8%)
Perceived severity: Seriousness of oneself or child getting diarrhea from oneself not washing one's hands.	112 (53.3%)	22 (10.5%)	76 (36.2%)
Perceived benefits: Goodness of washing one's hands before preparing food or before feeding a child/eating.	145 (69.1%)	24(11.4%)	41 (19.5 %)
Perceived barriers: Difficulty to wash ones hands before preparing food or before feeding a child/eating	15 (7.1%)	123 (58.6 %)	72 (34.3%)
Perceived self-efficacy: Confidence in washing one's hands properly?	89 (42.3%)	40 (19.1 %)	81 (38.6%)
Total attitude	**44.7%**	**22.9%**	**32.5**

Annex 3c. Respondents' practice in personal hygiene

Appropriate Personal Hygiene Practice	No (%)
1. Step-by-step description of hand washing	
a. Wash hands in a bowl of water (sharing with other people)	--
b. With someone pouring a little clean water from a jug onto one's hands – appropriate practice	83 (39.9 %)
c. Under running water — appropriate practice	41(19.7%)
d. Wash hands with soap or ashes— appropriate practice	41(19.7%)
Total appropriate practice	**26.2%**

Annex 4a. Respondents' knowledge in household water sanitation

Water Sanitation Knowledge	No. (%)
Treating unsafe water	
¨ Boil it	75(35.9%)
¨ Add bleach/chlorine	31 (14.8%)
¨ Strain it through a cloth	14 (6.7%)
¨ Use a water filter (ceramic, sand, composite, etc.)	8 (3.8%)
¨ Use solar disinfection	4(1.9%)
¨ Let it stand and settle	38 (18.2%)
¨ Discard it and get water from a safe source	26(12.4%)
Total knowledge	**13.3%**

Annex 4b. Respondents' attitude towards household water sanitation

Water Sanitation Attitude	It is	It is not	Not sure
Perceived susceptibility: Likelihood of oneself or one's child to get diarrhea from using unsafe water	117 (56.0 %)	13 (6.2 %)[1]	79 (37.8 %)
Perceived severity: Seriousness of getting sick from using unsafe water	106 (50.7 %)	18 (8.6 %)[2]	85 (40.7 %)
Perceived benefits: Goodness of boiling water before drinking or using it	133 (63.3 %)	48 (23.0 %)[3]	28 (13.4 %)
Perceived barriers: Difficulty of boiling water before drinking or using it	30(14.1 %)[4]	87(41.4 %)	92 (44.0 %)
Perceived self-efficacy: Confidence in boiling water before drinking or using it	87 (41.4 %)	85(40.7 %)[5]	35 (16.7 %)
Total attitude	**50.5%**	**24.01**	**30.5**

Annex 4c Respondents' practice in household water sanitation

Water Sanitation Practice	
1 The main source of water for a household for drinking, cooking, and hand washing	
- Piped water	61 (29.2 %)
- Piped into a dwelling	14 (6.7 %)
- Piped into yard or plot	12 (5.7 %)
- Public tap/standpipe	9 (4.3 %)
- Tube well/borehole/Protected well	13 (6.2%)
- Dug well	21 (10.0%)
2. Collection of water for domestic use	
- Yes (item used)	188 (89.5%)
- No	22 (10.5%)
3. Treating collection items to make them clean	
- Yes (how?)	207 (98.6 %)[1]
- No	--
No answer	3 (1.14 %)
4. Description of how water is stored	
¨ Covered container or jar	64 (30.5 %)
¨ Clean and covered container or jar	57 (27.1%)
¨ Clean container or jar	46 (21.9%)
¨ Don't know/no answer	43(20.5%)
5. Treatment of water to make it safe to drink	
--Yes	125 (59.5 %)
--No	199 (18.6%)
--Don't know/no answer	46 (21.9%)
6. Actions did to the water to make it safer to drink	
--Boil it	69 (32.9%)
--Let it stand and settle	49 (23.3%)
--Add bleach/chlorine	30 (14.3%)
-- Strain it through a cloth	17 (8.1%)
--Use solar disinfection	4 (1.9%)
--Don't know/no answer	23 (10.9%)