

Knowledge, Attitude and Practices For Nutrition And WASH Among Care Givers Of Children Under 5 Years Old In Hajjah And Hodeidah Governorates, Yemen¹

Amatullatief Abotaleb^{1*}, Adel Al-Emad¹, Abdulgabar Abdullah², Mahdi Ahmed, Bushra Rageh³, Ahmed Alderwish⁴

¹ Department of Community Medicine, Faculty of Medicine and Health Sciences, Sana'a University, Yemen ² Community Medicine, Ministry of Health and Population, Yemen . ³ Cardiac Center, Al-Thowrah Hospital, Sana'a, Yemen. ⁴ Department of Earth and Environmental Science, Sana'a University, Yemen.

Abstract

Background: *Appropriate feeding is important in improving nutritional status & child survival. UNICEF reported that malnutrition due to food insecurity in Yemen is alarming (> 15%). The water situation in Yemen is in severe crisis and 50% of Yemen's population does not have access to safe drinking water or sanitation. The aim of this study was to identify knowledge, attitude and practices of caregivers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates, Yemen. Methods: This was a KAP study with two-stage cluster sampling using the nutrition survey model. The principal tool to understand or define previous and current KAP towards recommended nutrition and WASH practice followed nutrition survey model which was adopted from the UNICEF's guideline for assessing nutrition. KAP survey assesses both the short-term outcomes of social behavior change activities like a change in knowledge or attitudes but also the medium and long-term outcomes, such as a change in actual behavior and the resultant practices. Results: There is good knowledge on breastfeeding, and its initiation within one hour after birth; and the breast milk ideal food for 0-6 months aged child. However, benefits of breastfeeding on mother is absolutely unknown by 39.9%. Average duration of breastfeeding is 18.5 months; however, cease of breastfeeding among 42.1% mothers was due to lack of breast milk. Only 1 in 5 children received daily 4+ items of food which indicates low rate of minimum diet diversity. 44% of households are using unprotected wells as a main source for their domestic/drinking water needs. In addition, there is potential contamination of water during handling inside house that highlights importance of providing more training about water handling at household level. Open defecation is practiced by 57.9% of households, 53.6% dispose the wastes behind the house. Overall 38.46% of HHs have latrines. About half of women wash hands after using the toilet, 38.2% before cooking, 65.7% before eating and 35.5% before feeding the child. No hand-wash premises among almost all households. Conclusion: There is a positive return on good nutrition practice and WASH practices of DRC investment.*

Keywords: : KAP, Nutrition, WASH, Caregiver, Children under 5 years, Yemen.

I. INTRODUCTION

Disease and malnutrition are closely linked. Malnutrition is the largest single contributor to disease in the world, according to the UN's Standing Committee on Nutrition (SCN). Malnutrition is an underlying cause of death of 2.6 million children each year – a third of child deaths globally [1]. A malnourished person finds that their body has difficulty doing normal functions such as growing and resisting disease. Physical work becomes problematic and even learning abilities can be diminished. Malnutrition at an early age leads to reduced physical and mental development during childhood. Iodine deficiency is the world's greatest single cause of mental retardation and brain damage. Under nutrition causes women give birth to low birth-weight babies [2]. 1 in 4 of the world's children are stunted [3]; in developing countries this is as high as one in three [4]. This means their bodies fail to develop fully as a result of malnutrition. Under nutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and contributes to delayed recovery. Poor nutrition in the first 1,000 days of a child's life can also lead to stunted growth, which is irreversible and associated with impairment [5].

Nutritionally-related health patterns in the Middle East have changed significantly during the last two decades. Within these changes, the Middle East has the highest dietary energy surplus of the developing countries. The population in the region has low poverty prevalence, at 4%. The region's child malnutrition rate is 19%, suggesting that nutrition insecurity remains a problem due to mainly poor health care and not due to inadequate dietary energy supply or poverty. In the Middle East, as in other parts of the world, large shifts have occurred in dietary and physical activity patterns. These changes are

Corresponding Author: Amatullatief Abotaleb; Department of Community Medicine Faculty of Medicine and health Sciences - Sana'a University

E-mail: wasamaif@hotmail.com

reflected in nutritional and health outcomes [6]. More than half a million children are facing life-threatening malnutrition in Yemen where the humanitarian crisis is worsening and the stunting rates in Yemen are likely to go up. It means children do not reach their full height but also that their cognitive capacities are affected, which becomes a permanent burden on the whole society. The United Nations has designated Yemen as one of its highest-level humanitarian crises with 80% of the population on the brink of famine. Aid deliveries have been severely restricted, compounding the crisis from four years of war that have left 10 million children in need of urgent relief [7].

Safe drinking water, sanitation and hygiene (WASH) are critical to people's health and well-being, especially to maternal, newborn and child health. Almost 10% of the global burden of disease is attributable to unsafe WASH and women and children are most affected by the consequences of poor access to these services. Cholera and watery diarrhea disease, resulting from contaminated food and water sources, is a leading cause of child mortality and morbidity, and diarrhoea is a major cause of malnutrition. Treatment alone will not break the cycle of transmission; improvements of WASH infrastructure and appropriate health-seeking behavior are essential to achieving sustained control, elimination, or eradication of many water borne diseases.

The aim of study was to identify knowledge, attitude and practices of care givers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates, Yemen.

II. MATERIALS AND METHODS

KAP study was administered to identify knowledge, attitude and practices of care givers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates. Six districts were targeted in the present study as had been identified by UNICEF as priority districts for funding based on their needs further analysis relating to both WASH and Nutrition. The districts include: Aslem, Mustaba and Bani Qais in Hajjah governorate and Al Garrahi, Al Munirah and Azzuhrah in Hodeidah governorate. The survey use two-stage cluster sampling and villages are considered as the smallest geographical unit (cluster). The survey covered women who have at least one child under 5 years old. Informed consent was obtained from the study participants after explaining the purpose of the study. Participation of all respondents in the assessment was on voluntary basis and respect, dignity, confidentiality, and freedom of each assessment participant was maintained during and after the survey.

For child care givers under 5 years old the sample size of households was drawn using the nutrition survey cluster sampling (30/13). Each cluster should include 30 eligible

households. Number of clusters at each of the 6 districts was determined proportionately with population size. Therefore, through a simple random sampling obtained one cluster of 30 households for each 10,000 or less population. This procedure allowed to having 13 clusters representing the 6 districts population. The sample size calculated was 416 of child care givers.

For school surveys: Elementary schools, 4 classes from the 2nd- 6th grades were selected randomly from each school. While for elementary and intermediary schools, 4 classes selected so that one class among the 7th to 9th grades and three classes from the 2nd to 6th grades. In schools include all levels (elementary, intermediate and secondary), one class from 1st,2nd and 3rd grades of the secondary level; one class from the upper three grades of the intermediate level and 2 classes from the 2nd-6th grades of the primary level were randomly selected. Samples of students to be interviewed were selected by dividing the number of class students by 10. In the class, the enumerators chose the first student whose order in the list fit with result of the division mentioned. All teachers of chosen classes in addition to social workers and school managers were also interviewed with students of the selected class. By this way, a total of 539 students and 74 teachers participated to the survey.

The questionnaire was administered to selected students, their teachers, social workers and school managers who all were gathered into one of school classes where they answer the questionnaire. The data collection tools include structured questionnaire relevant to KAP for the four main targeted groups including: child caregivers at household; teachers and students at schools, health care workers at health facilities; and community leaders at community level. The targeted four groups surveyed are strongly related to the existent WASH, nutrition and health integrated program that intends to alleviate the acute malnutrition among under 5 years children in targeted districts and communities known to be amongst the most affected areas with malnutrition in the country. Appropriate questionnaires for each category were developed, translated, pre-tested and approved by Danish Refugee Council in Yemen before being used in the field.

The principal tool to understand or define previous and current KAP towards recommended nutrition and WASH practice followed nutrition survey model which adopted from the UNICEF's guideline for assessing nutrition [8]. KAP survey assesses both the short-term outcomes of social behavior change activities like a change in knowledge or attitudes but also the medium and long-term outcomes, such as a change in actual behavior and the resultant practices.

Household questionnaire adopted from UNICEF manual for assessing nutrition-related KAP and WASH cluster guideline, were used to collect quantitative data from mothers/caregivers of children under 5 years old. The HH questionnaire had three modules; child feeding section (0-5 years), personal hygiene and WASH and Nutrition. Each module starts by asking

knowledge related questions followed by attitude and lastly practice related ones. This ensures that the information collected was consistent and that the interviewer was in good position to track any discrepancies while filling out household interview. The household questionnaire asks KAP questions on breastfeeding, complementary feeding, under-nutrition, WASH and questions related to pregnant and locating mothers feeding practice.

The community leaders survey were used to determine WASH (water situation, sewage system and solid waste management) and economic situation including livelihood, employment, income generating activities of HHs, affordability to seek health services by all people and nutritional support to malnourished women and children. School survey questionnaire had mainly two modules; School WASH (school water supply, storage and use, sanitation and solid waste management and food and body hygiene), and diseases recognition and protection measures knowledge with teacher define their roles. The health workers survey test questions include malnutrition diagnosis, case management both at clinic and at community level program.

The surveys were conducted from February to March 2014. Each enumeration area (cluster) was selected using a random systematic sampling (walking method) by enumerators. Household eligibility for inclusion in survey is that a woman should have at least one child under 5 years old. Field workers started from one defined health facility and one school geographical points. Accordingly, the fieldworkers in each locality then selected 18 households from zone area of each health facility and 12 households from zone area of each school. For selection of households, enumerators started with the first household located in front of the facility and thereafter walk in an o'clock wise direction.

III. STATISTICAL ANALYSIS

The survey data was entered in Excel program for cleaning at Danish Refugee office at Sana'a. The cleaned data then transferred to SPSS program (version 20) for statistical analysis. The entries for the variables for all the questionnaires were re-checked and cleaned again. All data entries from these questionnaires were compared with the data on the physical/hard copy of the questionnaires. The differences in the two governorates were statistically compared using Phi and Cramer's V Statistics (for categorical variables) and Analysis of Variance (ANOVA) (for the numerical variables) where the numbers of counts not less than 20%. P-values of less than 0.05 depicted significant statistical difference of the estimates by background characteristics. The survey covered women who have at least one child under 5 years old.

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IV. RESULTS

V. DEMOGRAPHIC CHARACTERISTICS OF WOMEN

Data collected included 416 households, 539 students 74 teachers, 52 health workers and 26 community leaders. The overall response rate was 99.52%. Hajjah was represented by 61.6% of the HHS survey. Moreover, 75% of the sample size in Hajjah was chosen from Aslam district. Age structure of women interviewed showed that 45% of women were of the middle age group (25-34), with a mean age of 30.1 years (Table 1). All women interviewed were married (99.03%) and 6 were divorced. The majority of women (57.9%) had 1-5 live children while 2.7% of the women had 11 children or more. women with 5-10 children (40%) indicated persistence of traditional fertility pattern. Differences between the 2 governorates in terms of number of live children are minimal.

Table 1: Distribution of women interviewed by governorate and district (n=414)

Governorate	District	Planned	Interviewed	%
Hajjah	Aslam	192	192	46.4
	Bani Qais	32	31	7.5
	Mustaba	32	32	7.7
	Total	256	255	61.6
Hodeidah	Al Munirah	64	64	15.4
	Al Garrahi	31	31	7.7
	AzZuhrah	64	64	15.4
	Total	159	159	38.4
Total		414	414	100

VI.

VII. KNOWLEDGE OF INFANT AND YOUNG CHILDREN FEEDING

Exclusive breastfeeding: 73.7% of women from Hajjah have been advised for exclusive breast feeding by their mothers; whereas 41.2% of mothers in Hodeidah were advised by health centers for exclusive breastfeeding. 48.1% of women reported that non-human milk is the best food to be given to the child of 0-6 months. Knowledge on starting breastfeeding: immediately or within one hour after birth was confirmed by 75.85 % of mothers. Only 18.6% of women were aware that breast milk is the right food for the child of 0-6 month's age and 19.8% knows that breast milk protects child from diseases. Benefits of breastfeeding on mothers: Almost 40% of women did not know any benefit of breastfeeding while only 1.2% women know that breastfeeding prevent pregnancy. **Sana'a University Journal of Medical and Health Sciences**; 3

Almost half or less of interviewed mothers were aware of benefits of breastfeeding including a bond between baby and mother, reduce breast cancer, and prevent pregnancy etc. (Table 2).

Table 2: Breastfeeding benefit on mothers (n=414)

BF Benefits on mothers	Hajjah (n=255)		Hodeidah (n=159)		Total	
	F	%	F	%	F	%
Creates a bond between baby and mother	78	18.8	64	15.5	142	34.3
Prevents mother from getting breast cancer in the future	34	8.2	16	3.9	50	12.1
It is free	33	8.0	10	2.4	43	10.4
Breast milk is ready to use	26	6.3	4	1.0	30	7.2
Babies who are breastfed will need less medical care	1	0.2	5	1.2	15	3.6
Attention as they are sick less often	52	12.6	15	3.6	67	16.2
Prevents pregnancy	3	0.7	2	0.5	5	1.2
Don't Know	100	24.2	65	15.7	165	39.9
Total	255	61.6	159	38.4	414	100.0

Table 3 shows the average number of food items given to the child in the past day in both governorates. About 80.15% of mothers were given 1-3 items while 19.86% were given ≥ 4 items.

Table 3: Average number of food items given to the child in the past day

Number of Items given	Hajjah		Hodeidah		Total	
	F	%	F	%	F	%
1-3 items	206	80.78	125	79.11	331	80.15
≥ 4 items	49	19.04	33	21.9	82	19.86
Total	255	100	158	100	413	100

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The children weight loss during the complementary food phase had been noticed by 42% of mothers, only 33.1% sought advice at health care service. A total of 35.5% mothers provided the child higher quantity of food than usual to regain the weight lost; while 16.9% did nothing about the weight lost (Table 4).

Table 4: Measures taken by mother when the child has lost weight when weaned (n=166)

What has been done	Hajjah (n=116)		Hodeidah (n= 50)		Total	
	F	%	F	%	F	%
Went to health center	33	19.9	22	13.3	55	33.1
Asked family member for advice	3	1.8	0	0.0	3	1.8
Gave the baby more food	43	25.9	16	9.6	59	35.5
Changed the diet of the baby	8	4.8	4	2.4	12	7.2
Went to midwife/health worker	4	2.4	2	1.2	6	3.6
Went to see the traditional healer	2	1.2	1	0.6	3	1.8
Did nothing	23	13.9	5	3.0	28	16.9
Total	116	69.9	50	30.1	166	100.0

Practices and attitude of infant and young child feeding 57.2% of women-initiated breastfeeding immediately or within one hour after birth, while 20% within first hour after birth (8.5% in the first day and 12% within the second day) (Table 5).

Table 5: First time women put the child to the breast by governorate (n=414)

Statements	Hajjah (n=255)		Hodeidah (n=159)		Total	
	F	%	F	%	F	%
Immediately	14	33.	9	23.4	23	57.
y	0	8	7		7	2
Within first hour after birth	48	11.	3	8.5	83	20.
		6	5		0	
Within first day	23	5.6	1	2.9	35	8.5
			2			

Within second day	39	9.4	9	2.2	48	11.6
Don't know			1.4	11	2.7	
Total			38.4	414	100.0	

VIII. INFORMATION ON BREASTFEEDING

For 88.33% of women, the knowledge on breast feeding originated from close relatives to the child, such as mothers (44.6%), mothers in law (8.7%), sisters (8.1%), aunts (15%) and grandmothers (7.2%); while 16.2% of women received information on breastfeeding from health care midwife. Three out of four women believe that the best time to initiate breast feeding is immediately/within 1hr after birth and only 16.67% of women know that duration of exclusive breast feeding is 6 months. Nearly half of women (48.1%) consider the breast milk is ideal food for 0-6 months aged child while 91% of women reported that breastfeeding on demand is enough despite that the benefits of breastfeeding on mother is absolutely unknown by 39.9% of mothers. In terms of breastfeeding duration, about 43.16% of women breastfeed their children for 24 months (Table 6).

Table 6: Breastfeeding duration by child age (n=95)

Breastfeeding duration (months)	Hajjah (n= 66)		Hodeidah (n=29)		Total	
	F	%	F	%	F	%
	Less than 24 months	37	38.9	12	12.6	49
24 months	26	27.4	15	15.8	41	43.2
≥ months	3	3.2	2	2.1	5	5.3
Total	66	69.5	29	30.5	95	100.0

Almost 93.7% of women believed that 6+ months is the appropriate age to complementary food for a child. Only 1 in 5 children received daily 4+ items of food. One in three women feed the child of 6+ months age in accordance with recommended minimum meal frequency (4 times/24 hours). About 38% of women introduced the complementary food to the child earlier than the WHO recommended age of 6-8 months. The most common reason given for stopping breastfeeding was insufficiency of breast milk in 42.1% of mothers, followed by new pregnancy occurrence in 38.9% of women.

IX. WATER, SANITATION AND HYGIENE

Water supply: The current households survey shows that the main source of domestic and drinking water is unprotected well (42.6%), followed by piped water supply (24.7%) and only (15.8%) getting their drinking water from protected sources (Table 7). Community leaders in both governments reported that the main source of water in the areas is surface water in 50.0%.

Table 7: Distribution of main source of drinking water (n=416)

Main source of drinking water	Hajjah (n= 256)		Hodeidah (n=160)		Total	
	F	%	F	%	F	%
Piped water	50	12.0	53	12.7	103	24.8
Tanker	4	1.0	13	3.1	17	4.1
Public	0	0.0	1	0.2	1	0.2
Tube well	1	0.2	22	5.3	23	5.5
Protected	18	4.3	48	11.5	66	15.9
Unprotected	154	37.0	23	5.5	177	42.5
Valley	29	7.0	0	0.0	29	7.0
Total	256	61.5	160	38.5	416	100.0

Sanitation: Defecation in the open was practiced by 57.93% of house-holds, with 38.5% having latrines. Most latrines (92.57%) were located inside the house-holds and are used by the vast majority (94.86%) of family members (Table 6). Improved ventilated latrine was available for 25% of house-holds.

Type of latrine	Hajjah (n=256)		Hodeidah (n=160)		Total	
	F	%	F	%	F	%
Pour flush latrine to piped sewer system or Septic tank	1	0.2	1	0.2	2	0.5
Ventilated Improved pit (VIP) latrine	42	10.1	62	14.9	104	25.0
Traditional toilet (a simple hole)	32	7.7	24	5.8	56	13.5
Mobile toilet (bowl or bucket)	1	0.2	2	0.5	3	0.7
Public toilet	3	0.7	7	1.7	10	2.4
In the open	177	42.5	64	15.4	241	57.9
Total	256	61.5	160	38.5	416	100.0

Table 8: Type of latrine used (n=416)

Hygiene: Hand washing with water and soap rate differs with each of the most critical moments. About 50.5% of women wash hands after using the toilet, 38.2% before cooking, 65.7% before eating and 35.5% before feeding the child. Hand washing premises were lacking among all households (99.76%). Over half of households (53.6%) dispose their solid wastes behind the house. Women who drink boiled water counted for 46%, while 35% do not know what to do to prevent diseases; with only 23% cover and protect drinking water.

Figure 1 indicates the overall scores obtained by respondents by governorate. The health care workers who choose the right answer were only 21 (40%).

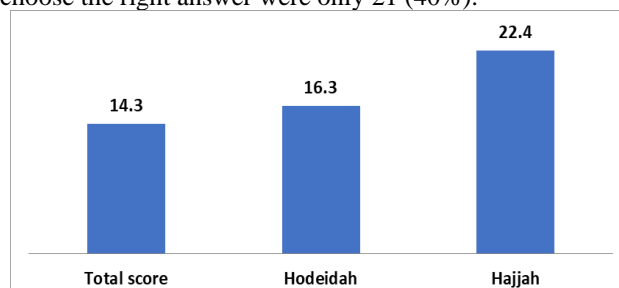


Figure 1: Health workers final scores by governorate

A. Discussion

The educational level of women interviewed was very low with 79.47% being illiterate. Illiteracy at this level is higher than the national rate of rural women illiteracy (62.2%) [9]. Occupational status of women interviewed was poor where

94% were housewives and only 4.1% were handcrafts women. Despite high percentage of Yemeni women were advised to breastfeed, only 16.9% know the recommended duration of 6 months for exclusive breastfeeding. Results of this study show that mothers have much lower knowledge and negative attitude towards exclusive breastfeeding than similar study conducted in Egyptian mothers, who all agreed that breastfeeding is the best nutritional source for infant 0-6 [10]. These unsatisfying results are due to the fact that most of Yemeni mothers lack access to information's of recommend infant feeding guidelines and a cumulative traditional miss concept. Women, who did not have access to correct information, consequently lacked knowledge which contributed to the increasing rates of malnutrition in the region [10]. The minimum diet diversity indicator depends on 7 food items, out of which any 4 of them will ensure protein/fat and energy needs of children aged 6-23 months [11].

Benefits of breastfeeding on mothers are far from being captured. Almost 40% of women do not know any benefit of breastfeeding while only 1.2% knows that breastfeeding prevent pregnancy. This figure is far below the 31% of reported women in Ethiopia who were aware that breastfeeding prevent pregnancy [12]. The gap is probably the result of lack of women's rights to know the different contraceptive methods; including Lactation-AmenorrheaPeriod (LAMP method) which might have been neglected by the reproductive health service providers which failed to cover all mothers in the country and ignorant of mothers about family planning programs. Poverty also keeps many mothers away from reaching the available few family planning services.

There is low knowledge about diet diversity with only 19.86% of children received 4 food items during the past day instead of the minimum diet diversity indicator which depend on 7 food items and thus indicate poor dietary profile for 4 out of 5 children. The minimum diet diversity percentage is less than that reported previously as 29% by the NHS-1012 in Hodeidah [13]. This survey found that almost half of Yemeni children lost their weight during the complementary food phase most probably due to poverty level. This pushed Yemeni mother to make a standard tinny formula, which lasts for 4 days to be used for up to two weeks through diluting the product, so it fails to nourish the child. This is simply because families do not afford to buy the product regularly and/or putting family in extreme situation to do so [13].

Most of women (77.2%) initiate breastfeeding immediately or within one hour after birth, and thus had initiated the breast feeding appropriately according to WHO & UNICEF recommended time. This percentage is similar to that obtained in studies in India (70.29%) [14] and 72.7% in western Nepal [15]. About 43.16% of women breastfeed for 24 month that is comparable to findings from other studies in America. On the **Sana'a University Journal of Medical and Health Sciences** 6

other hand, up to 12 months was high among the respondents (73%) in Southwest Nigeria [16]. In our country, mothers continue breast feeding for longer duration most probably due to religious reasons as Quran promote breast feeding for successful two years [17]. In this survey, exclusive breastfeeding rate of children 0-5 months was 13.5%, which is almost similar to an American study whereby only 13% of mothers were still exclusively breastfeeding when their infants reach 6 months, equals the length of time recommended by the WHO and the AAP [18]. However, much lower than a similar study in Accra, Ghana [19].

Almost 38% of women introduce the complementary food to the child earlier than the WHO recommended age of 6-8 months. These results indicate lower percentage than those previously reported in rural areas in Yemen as 75% [20]. The most common reason given for stopping breastfeeding was insufficiency of breast milk in 42.1% of mothers, similar to studies carried out in Saudi Arabia 43% [21]. This could be due to sub-optimal breast feeding practices including infrequent feedings, short duration of feedings, feeding from only one breast, and missing nocturnal breastfeeding's [22]. Other cause could be insufficient care giver knowledge on the recommended breast feeding length rime and how to sustain breast feeding.

Mothers often made the decision that their breast milk was insufficient because their baby cried after nursing or other family members advised them that their baby needed additional food [23]. The effect of these factors is likely to be the reason that 58% of the participants shifted to complementary food and Yemini children still could not reach the standard breastfeeding time recommended by WHO. When mothers feel that child loses weight, 37.6% of them increase food quantity, 35% seek health assistance while 17.8% of women do nothing. When child get sick, 68.12% of children drink more than usual quantity of liquids, while 97.82% eat less than usual quantity of food which dispose them at nutrition & health risks such as under nutrition. Advice on quality and quantity of food given to the child needs originates from mother experience and knowledge in 44.4%, and from women group (23.9%) and mothers in law (19.1%). Some 16.2% do not know their source of information.

The study revealed that 46.5% of population obtains water from unimproved water sources and 70% did not know how to treat water for safe consumption [24]. While the world has met the Millennium Development Goal target for access to improved drinking water, Yemen is one of the few off-track countries and was not able to meet its target by 2015 [25]. With only 24.8% of surveyed households have connection to water network; women, girls and boys are burdened with

water fetching from sources. A trip to fetch water takes 30-60 minutes in 45.39% of house-holds, and 60 minutes or more in 12.29%. This indicates that the time spent to fetch water by about 57.67% of households is above the international Sphere standards of 30 minutes or less walk distance. It has been noticed that water quality in the households is often contaminated due to inappropriate water storage at the household level, leading to contamination of otherwise clean water. A divergent situation was found regarding the unprotected and unsafe sources of drinking water [26]. Water supply in Yemen is characterized by many challenges include: severe water scarcity, high level of poverty, making it difficult to recover the costs of service provision; limited capacity of sector institutions to plan, build, operate and maintain infrastructure; and the security situation makes it even more difficult to improve or even maintain existing levels of service. These figures in agreement with a recent study carried out by WASH cluster on WASH needs assessment in 28 districts of Hajjah, Amran, Al Hodeida, and Raymah governorates which found that 69.7% of the surveyed population don't have sufficient water supply. Similarly to current study, that Almost 1 in 4 households store water in plastic bucket. Pouring was used to collect water from the storage to the point of use by 73.3% households.

Furthermore, some studies suggest heterogeneous effects of improved water supply and complementarities between health and education. For instance, Jalan and Ravallion [27] found that piped water has no significant impact on diarrhoea among the poorest groups which they explain by a lack of education. Study by Alderwish and Dottridge [28] indicates that contamination occurs due to the need for households to store water in the house instead of using tap water directly. This need arises from the shortage of supply, inadequate quantity supplied or expense [29].

Sanitation is almost absent but for some CLs it's still substandard. As well known in UN, for decades, sanitation was considered to be as poor as water. About 20 million people are now in need of water and sanitation, increased by 52% since before the Saudi Arabian-led intervention in Yemen started, and the price of water has increased so much that some families spend a third of their income on water. Yemenis have resorted to collecting water in buckets when it rains. The situation has led to the spread of disease, including dengue and malaria. While 35% of women do not know what to do to prevent diseases, just 23% cover and protect drinking water. The above figures may explain reasons of the diarrhea high prevalence rates.

X. CONCLUSION

Recommended practice for good nutrition such as exclusive breastfeeding, continued breastfeeding, diversity score were relatively stronger and better among mothers living in

Hodeidah than Hajjah, even though the difference between the two were not statistically significant. Furthermore, knowledge on importance of exclusive breastfeeding among mothers, actual practice and knowledge on importance of breastfeeding averaged until a child reaches 18.5 months. Benefits of breastfeeding on mother are absolutely unknown. Knowledge, attitude and practice on WASH related recommended behaviors were negative in mothers in both governorates. In addition, clear lack of WASH hardware is evidenced. Therefore, there is room for improvement in both soft and hardware component in these areas so it can be effective enough to change the KAP of targeted population of Hajjah and Hodeidah governorates. **Competing interests** None declared.

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