



# **Mothers Knowledge, Attitude and Practice Regarding Diarrhea and its Management in Aden-Yemen: A Cross-Sectional Study in Poor Resource Setting**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Diarrheal diseases are still a major cause of mortality and morbidity after respiratory infection in most developing countries. There are about 1.7 billion cases of diarrheal illness and 760,000 deaths in children under 5 every year around the world. Moreover, it has an undesirable effect on the development and growth of infants and young children.

**Aim:** The main objective of this study was to evaluate the mothers' knowledge, attitude, and practice (KAP) regarding diarrhea and its management in Aden-Yemen.

**Methods:** A cross-sectional study was conducted among mothers who visited Aden health centers in Aden city from April 2020 to July 2020. The respondents were chosen conveniently due to the difficulty of having a sampling frame. Data was collected using a KAP questionnaire.

**Results:** A total of 414 mothers aged 18 - 40 years had a child/children with diarrhea at the time of enrollment or in the preceding 3 to 6 months from enrollment. About 344 (83.1%) of mothers knew the definition of diarrhea, 244 (58.9 %) of mothers attributed the teething as a cause of diarrhea, and 284 (68.6%) of mothers recognized lethargy as a sign of dehydration. Nearly 201 (48.6 %) of the mothers mentioned that diarrhea could be managed and prevented at home, and 174 (42.0%) agreed that ORS is the first-line treatment for diarrhea, and 286 (69.1%) of mothers continue exclusive breastfeeding during diarrhea. However, only 170 (41.1%) of mothers prepared ORS at home, and most of them did not know the correct way of preparing it. About 327 (79.0%) of mothers consulted the medical centers during the episode, and 199 (48.1 %) of mothers took the child to the primary health center as an immediate response.

**Conclusion:** The findings revealed that the KAP of the mothers was unsatisfactory for the management of diarrheal diseases. Therefore, there must be educational intervention provided by health sectors to increase awareness. Furthermore, the government should provide quality water, sanitation, essential medicines, public education, etc., to reduce the causes of the prevalence of diarrhea.

*Keywords: Developing countries; knowledge; attitude; practice; diarrhea; mothers.*

## 1. INTRODUCTION

Diarrhea can be defined as a habitual watery stool passage more than three times per day. Acute diarrhea is an illness condition of unexpected onset, which generally continues for 3-7 days but may last up to 10-14 days. Continuing the liquid stool for more than 14 days is considered a chronic form [1,2]. It is produced by the passage of the contaminated food or drinks by the causative pathogen from the feces of the infected patient to the mouth of another [3]. It is not lethal but may lead to death if the lost of fluid is not adequately substituted. Diarrhea is the leading cause of mortality and morbidity after respiratory infection in most developing countries. There are about 1.7 billion cases of diarrheal illness and 760,000 deaths in children under 5 every year around the world [4]. In addition, it has an undesirable effect on the development and growth of infants and young children [5].

In Yemen, due to the 2015 war, there was massive destruction of the infrastructure in most governorates, migration of people, overcrowding in emigrant camps, and an unhygienic sanitation lifestyle. These led to the speeding of the cholera epidemic in several areas of the country. As a result, Yemen faced the globally largest cholera outbreak in 2017, where about 1 million cases were reported. According to Muscat/Amman/Cairo studies, about 109,000 cases of severe acute watery diarrhea and suspected cholera were reported from the beginning of 2019 to May. Nearly 33% of the death cases were of children under five years from diarrhea [6]. Based on the living condition in

Yemen, several families in the cities are under fire. People in the emigrant camps are suffering from starvation, an insufficient supply of medicine, and many diseases such as malaria, dengue fever, and diarrhea that exacerbate malnutrition and lead to death. The authors expected that with the persistence of the war and the absence of the essential needs of everyday life such as clean water, proper sanitation network, and integrated electricity system, the continuing episodes of diarrhea are expected to increase.

Proper management at a suitable time at home and medical centers is the first step to reduce morbidity and mortality from diarrhea [7]. Generally, diarrhea is not a serious illness that may lead to death, so it is commonly left without medical intervention or treated at home with traditional medicines [8]. However, low health information and education levels are major obstacles to proper and timely health intervention [9]. Simple practices such as clean water, latrines, proper hygiene, breastfeeding limited nourishing for the beginning six months of the baby's age, zinc and antimicrobial therapy, early estimation of dangerous dehydration signs, and rotavirus vaccine could help in avoiding continuous diarrhea [10]. However, the polluted water with microorganisms can cause frequent vomiting, diarrhea and, in life-threatening cases, can lead to death by dehydration within hours [11].

The symptoms of diarrhea, such as dehydration, can be prevented and treated by the adequate administration of the Oral Rehydration Solution (ORS). The ORS is a mixture of glucose and

electrolytes that considers cheap and highly recommended by the World Health Organization (WHO) to prevent and replace the lost of fluid and essential electrolytes. It was reported that the use of the ORS reduces the number of death due to diarrhea [12]. On the other hand, the WHO guideline stated that the administration of the antibacterial and antidiarrheal has little benefit [13]. Therefore, though the physicians should follow the proper application guidelines for diarrhea management, they should educate mothers on home-handling procedures to reduce the increasing number of diarrhea cases. The literature on knowledge, attitude and practice (KAP) regarding the management of diarrhea indicates poor attitude and practice. There were knowledge gaps for proper preparation and administration of ORS among most surveyed mothers [14,15]. Also, the poor practice of preparing and uses of ORS was reported [16,17]. Home care management by the mothers is considered of the utmost importance because they are the primary ill child caregiver. However, the mother's knowledge is affected by several factors: education, the standard of living, and economic status.

This study intends to proceed with a cross-sectional study to detect the exact status of knowledge, attitude, and practice of mothers handling and managing diarrhea with children under five years old. This study will help the stakeholders to design a structured educational program for effective prevention and management of diarrhea. The literature survey indicated that there were no comparable studies done in Aden city-Yemen.

As specified above, the lack of management of diarrhea is a significant risk factor worldwide, particularly getting worse in developing countries due to the lack of awareness among mothers. In addition, lack of experience in the proper therapy intervention and the poor living situation due to conflict in the past five years led to an increase in diarrheal outbreaks.

This study aimed to assess mothers' knowledge, attitude, and practice to reduce the morbidity and mortality related to diarrheal diseases for children under five years old at various hospitals and private diagnostic services laboratories or homes in Aden-Yemen.

Findings from this study will provide and educate the mother with quick response behavior and prompt intuition in prevention and management.

This study has many important implications that can provide health care policymakers and planners with valuable data to explore the current level of knowledge among mothers towards diarrhea and its management. In addition, it will provide baseline data that can be used in future evaluation or reconstruction plans for diarrhea management and public education.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

The design of the study was a cross-sectional descriptive study. The study was carried out from April 2020 to July 2020 in Aden city at Aden health centers.

### 2.2 Study Population and Sample Size

The study population was the mothers who visited Aden health centers in Aden city. The mother was targeted because they are the immediate and most reliable caregivers to their children. Thus, their knowledge, attitude, and practices are more significant than the other family members. The subjects were eligible to be enrolled in the study if they were between the age of 18 - 40 years, had a child/children with diarrhea at the time of enrollment or in the preceding 3 to 6 months from the time of enrollment, and were willing to participate in the study.

The total number of respondents who took part in our research was 500 mothers. The following formula was used to obtain the minimum required sample size:

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

Where n= sample size,

Z= Z statistic for a level of confidence,  
 P= expected prevalence or proportion (in proportion of one; if 50%, P= 0.5), and  
 d=precision( in proportion of one; 5%, d=0.05).  
 Z statistic (Z): for the level of confidence of 95%, which is conventional Z value is 1.96.

Based on the dropout rate of 30%, the final sample size, n=500.

The respondents were chosen conveniently due to the difficulty of having a sampling frame. All of

them were residing in Aden City. In addition, respondents with different education levels were selected for this study.

### 2.3 Study Questionnaire

The following KAP questionnaire were used in the study. In addition, a KAP questionnaire was used in the study to evaluate the knowledge, attitude, and practices of the mothers towards diarrhea and management of diarrhea.

These questions were initially made in English and then translated to the local Arabic language. Forward and backward translation steps were taken to ensure the quality of the final Arabic version.

### 2.4 Outcome Measures and Operational Definition

The study measures the mother's knowledge, attitude, and practice regarding diarrhea and management of diarrhea.

The operational definitions for these terms are as follows:

*Knowledge:* Knowledge is a set of understandings, knowledge, and "science." It is also one's capacity for imagining, one's way of perceiving. However, knowledge of a health behavior considered beneficial does not automatically mean that this behavior will be followed. The degree of knowledge assessed by the survey helps locate areas where information and education efforts remain to be exerted [18].

*Attitude:* Attitude is a way of being, a position. These are leanings or "tendencies to...". This factor is an intermediate variable between the situation and the response to this situation. It helps explain that among the possible practices for a subject submitted to a stimulus, that subject adopts one practice and not another. Attitudes are not directly observable as practice. Thus, it is a good idea to assess them. It is interesting to note that numerous studies have often shown a low and sometimes no connection between attitude and practices [18].

*Practice:* Practices or behaviors are the observable actions of an individual in response to a stimulus. This factor is something that deals with the concrete, with actions. For example, for practices related to health, one collects information on consumption of tobacco or

alcohol, the practice of screening, vaccination practices, sporting activities, sexuality, etc. [18].

### 2.5 Data Collection Procedure

A self-administered structured questionnaire was specially prepared from different sources [4] to meet the study objectives. The questionnaire consists of four sections: background status, mothers' knowledge about diarrhea management, the attitude of mothers toward prevention and management of diarrhea in their children, and assessment of the practice of mothers in prevention and management of diarrhea in their children.

The Arabic version of the questionnaire was pre-tested by allocating 30 mothers in health centers to identify unclear or difficult questions and ensure the adequacy of content and length. After minor changes, the questionnaire was completed and distributed to the target group. The reliability of the questionnaire was verified by calculating Cronbach Alpha from completed questionnaires. The alpha score was 0.76, and it was considered acceptable. The questionnaires were distributed among mothers in the different health centers in Aden city by trained pharmacy students.

### 2.6 Data Analysis

The data collected from the questionnaires were analyzed using the Statistical Package for Social Science (SPSS®) version 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). First, frequency counts were checked for all the variables. Then, descriptive statistics such as frequencies, percentages, and means (SD) were used to analyze the data.

## 3. RESULTS

### 3.1 Characteristics of Mothers

Four hundred fourteen questionnaires were collected from different governates at Aden cities i.e. Krater, Khormakser, Mansoura, Sheik, and Mualla; mostly from Mansoura (n=110, 26.6%), and 101 (24.4%) from Krater as shown in Table 1. The mean age of mothers was 32.6 ±11.5 years old (ranges from 20-83 years old). The mean age of children was 5.0 ± 0.61 months old (ranges from 1-6 months old). About 50% of the mothers are housewives, and the remaining are government employees (31.2%) and/or have work privately (16.9%). Most families have

medium income (54.8%), and about 35.7 % have low income; only 9.4% have a high income. As well, most mothers (64.0%) have a secondary school education.

### 3.2 Mothers' Knowledge on Diarrhoeal Disease Prevention and Management

The result relating to the knowledge of the mother about diarrhea management are represented in Table 2. Most mothers (83.1%) knew that diarrhea is the passage of watery stools three or more times a day. Only 3.9% had no idea about diarrhea. About 58.9% of the mother had a misconception that the cause of the diarrhea is teething, and only 26.8% of the mothers attributed the cause to unhygienic surroundings.

About 68.6% of the mothers had a concept that the danger signs of dehydration are weakness, while 12.1% knew that it might be associated with frequent vomiting, and 6.8% had an idea that it might be accompanied by fever and blood in the stool. The mothers' knowledge about the prevention of diarrhea was distributed nearly equally between clean drinking water (26.3%), eating clean food (19.6%), handwashing with soap (12.6%), sterilizing the milk bottle (23.7%), increased feeding time of milk (7.5%), and having no idea (10.4%). Slightly more than half of

the mothers only knew the treatment of dehydration (58.2%), and 51.2% of the mothers knew how to prepare ready-made ORT. Most mothers (41.3%) did not know how to prepare the ORS at home by mixing sugar and salt. Only 38.6% of the mothers knew that the ORS should be given after each liquid diarrhea, and 50.5% knew that the ORS should be kept for 24 hours.

### 3.3 Mothers Attitudes toward Prevention and Management of Diarrhea of their Children

Table 3 shows the attitude of mothers toward the prevention and management of diarrhea of their children. About 82.7% of the mothers agree and slightly agree that diarrhea could be prevented and manageable at home. About 67.1% agree and slightly agree that ORS is the first line of treatment for diarrhea. Nearly 91.5% and 92% of the mothers had a healthy habit of washing hands with soap after defecation, and after dealing with the defecation of the child. Also, most mothers had a healthy habit of the secure disposal of the child feces. Regarding exclusive breastfeeding and the increasing amount of giving fluids during diarrhea, the attitude was relatively good with 69.1% and 69.3%, respectively.

**Table 1. Frequency and percentage distribution of sociodemographic characteristics of study participants (n=500)**

Characteristics	Category	Frequency	Percentage, %
Mother Age	16 – 25 years	124	30.0
	26 – 30 years	159	38.4
	> 30 years	131	31.6
	< 6 months	324	78.3
Child's age	6 – 11 months	19	4.6
	12 – 23 months	17	4.1
	24 – 35 months	16	3.9
Job	> 35 months	38	9.2
	Housewife	215	51.9
	Government employee	129	31.2
Income	Private job	70	16.9
	High	39	9.4
	Medium	227	54.8
Parents Education	Low	148	35.7
	Illiterate	55	13.3
	Primary	94	22.7
Governorate	Secondary	265	64.0
	Kraeter	101	24.4
	Khormakser	46	11.1
	Mansoura	110	26.6
	Sheik	96	23.2
	Mualla	61	14.7

**Table 2. Frequency and percentage distribution of knowledge of mothers about diarrhea management. (n=500)**

Knowledge	Category	Frequency	Percentage, %
What is diarrhea?	Frequent passing of watery stool (3 or more times)	344	83.1
	Frequent passing of non-watery stool	34	8.2
	Blood in stools	12	2.9
	Greenish stools	8	1.9
	No idea	16	3.9
What are the causes of diarrhea?	Teething	244	58.9
	Unhygienic surroundings	111	26.8
	Worm infestation	38	9.2
Sign of dehydration	No idea	21	5.1
	Lethargy	284	68.6
	Frequent Vomiting	50	12.1
	Fever and Bloody Stool	28	6.8
	Thirsty	33	8.0
How to prevent diarrhea from your child?	No Idea	19	4.6
	Drink Clean Water	109	26.3
	Clean Food	81	19.6
	Hand Wash with Soap	52	12.6
	Sterilize the Milk bottle	98	23.7
Do you know the treatment of dehydration?	Increase Feeding Time of Milk	31	7.5
	No Idea	43	10.4
	Yes	241	58.2
	No	173	41.8
	If yes, the uses of oral rehydration therapy (ORS)	Add The Lost Water	182
Treat Diarrhea		91	22.0
No Idea		141	34.1
Do you know how to prepare ORS?	Yes	212	51.2
	No	202	48.8
How do you prepare ORS?	Half Teaspoon Salt+6 Teaspoon Sugar + Liter Water	134	32.4
	Other Preparation	109	26.3
	No Idea	171	41.3
	How many times do you give your child the ORS?	After Each Liquid Diarrhea	160
Once A Day		75	18.1
2-3 Times		113	27.3
Every Time the Child Want to Drink		66	15.9
How long do you keep the ORS after preparation?	24 hours	209	50.5
	48 hours	66	15.9
	72 hours	26	6.3
	96 hours	6	1.4
	Don't know	107	25.8

**Table 3. Frequency and percentage distribution of attitude of mothers toward prevention and management of diarrhea of their children. (n=500)**

Attitude	Category	Frequency	Percentage, %
Diarrhea is a preventable disease and it is manageable at home?	Agree	201	48.6
	Slightly Agree	141	34.1
	Disagree	40	9.7
	Not Sure	32	7.7
ORS is the first line of treatment for diarrhea?	Agree	174	42.0
	Slightly Agree	104	25.1

Attitude	Category	Frequency	Percentage, %
Drinking clean water to prevent diarrhea?	Disagree	49	11.8
	Not Sure	87	21.0
	Agree	274	66.2
	Slightly Agree	73	17.6
	Disagree	34	8.2
Washing hands with habit of soap after defecating	Not Sure	33	8.0
	Agree	342	82.6
	Slightly Agree	37	8.9
	Disagree	7	1.7
Wash of hand with soap after dealing with defecation of the child?	Not Sure	28	6.8
	Agree	371	89.6
	Slightly Agree	10	2.4
	Disagree	8	1.9
Secure disposable the fees of child	Not Sure	25	6.0
	Agree	376	90.8
	Slightly Agree	11	2.7
	Disagree	21	5.1
Exclusive breastfeeding during diarrhea	Not Sure	6	1.4
	Agree	286	69.1
	Slightly Agree	49	11.8
	Disagree	33	8.0
Increasing amount of giving fluids in management of diarrhea	Not Sure	46	11.1
	Agree	287	69.3
	Slightly Agree	62	15.0
	Disagree	37	8.9
	Not Sure	28	6.8

**Table 4. Frequency and percentage distribution of practice of mothers in the prevention and the management of diarrhea in their children. (n=500)**

Practice	Category	Frequency	Percentage, %
Do you prepare oral rehydration solution (ORS) at home?	Yes	170	41.1
	No	244	58.9
How is ORS prepared?	One sachet from 300 in one bottle	57	13.8
	One sachet from 500 ml	82	19.8
	One sachet of 600 ml	36	8.7
	One sachet of 1000 ml	4	1.0
	Others	31	7.5
	Don't know	204	49.3
Usually, dispose of child's stool by	Children use the toilet	110	26.6
	Put the fees in the toilet	147	35.5
	Threw the fees in the dustbin	137	33.1
	Don't care	20	4.8
If your child suffers from diarrhea how many times you give him breastfeeding	Less than usual	71	17.1
	Same usual	104	25.1
	More than usual	198	47.8
	Don't know	41	9.9
Take the medical consolation from	Herbal medicine	40	9.7
	Medical Centre	327	79.0
	Others	47	11.4
Immediate response	Take the child to the primary health center	199	48.1
	Home care with ORS	157	37.9
	Home care with available medicine	33	8.0
	Wait until three days if diarrhea is	25	6.0

Practice	Category	Frequency	Percentage, %
Usually wash your hand	increasing then take the child to health		
	Never	54	13.0
	Before preparing the food	177	42.8
	Before feeding child	97	23.4
	After clean the child fees	23	5.6
	Sometimes	37	8.9
	Most times	26	6.3

### 3.4 Mothers' Practices on Diarrhoeal Disease Prevention and Management

The survey results related to the assessment of the practice of mothers in the prevention and management of diarrhea in their children are represented in Table 4. Slightly more than half of the mothers did not prepare ORS at home, and nearly half of them did not know how to prepare it (49.3%). About 33.1% of the mothers threw the feces in the dustbin, and 35.5% put the feces in the toilet. Only 47.8% of the mothers had the attitude of increasing breastfeeding during diarrhea. About 79.0% of the mothers get medical advice from a medical center, 9.7% get it from herbal medicine sellers, and 11.4% from others. Only 48.1% of the mothers take the child to the primary health center, 37.9% provide home care with ORS, 8.0% offer home care with available medicine, and 6.0% wait until three days if diarrhea is increasing then take the child to health center. Only 5.6% of the mothers usually wash their hands after cleaning the child's feces, and 42.8% wash their hands before preparing the food.

## 4. DISCUSSION

The current study was conducted in Aden-city to evaluate the KAP of mothers in the management of diarrheal diseases. The overall findings indicated that the KAP regarding childhood diarrhea among mothers in the studied area were less satisfactory. According to epidemiological theory, diarrhea is influenced by three factors: host, agent, and environment. In addition, the host includes the age of the child and nutrition [19].

The war in Yemen has been affecting all aspects of everyday human living status. Most of the families had a medium income. However, due to the currency's instability (the Yemeni Riyal against the dollar), the citizen is living difficult living conditions in light of the increase in basic

foodstuffs prices in a severe manner. In addition, Yemen is living the worst famine crisis globally; the number of malnourished children has been increasing [20]. Besides that, Yemen is exposed to seasonal rains and floods annually, which may increase the risk of epidemics, including diarrhea [21]. All this leads to poor nutrition and or less nutrition, weakening the body's immunity against several diseases, including diarrhea. In addition, socioeconomic status plays a significant role in achieving the required knowledge, attitude, and practice [22].

The mother's age plays an important role in acquiring knowledge, attitude, and good practice for the management of diarrhea. More young mothers are more ready in accepting new knowledge and practice. Besides age, education is an essential factor determining the ease and speed of gaining the required information about the proper management of diarrhea. There is a correlation between the level of education and attitude. Educated mothers positively influence educating their children about the proper hygienic practices, significantly influencing the prevalence of diarrhea. The result of the current study represented that most mothers were of primary and secondary education. According to a study in Nigeria, the prevalence of diarrhea was high among children whose mothers had no formal education compared to those whose mothers had higher education [23]. About half of the mothers were housewives, which means more time to handle the child during the diarrheal episode. As stated in a study in Gambia, mothers with more than two children had a good level of knowledge more than mothers with one child, [24]. The diarrhea is expected in the children age group between 36 - 45 months. It is more prevalent in teething and weaning breastmilk because the children put every reached tool, toys,...etc in their mouth that can cause infectious diseases, including diarrhea. However, the prevalence is decreased with increasing the child age [25].

#### 4.1 Mothers' Knowledge on Diarrhoeal Disease Prevention and Management

The current study's finding proposed that most mothers had a correct concept of diarrheal disease according to the definition of WHO (2). The result was slightly higher than the study carried out in Nepal (79%) [26] and more than the study conducted in Sudan (35%) [27], the Philippines (65%) [28], and Turkey (40%) [29]. Relating to the causes of diarrhea, more than half of the mothers attributed to the teething, about 75% of mothers had a similar misconception in a study in Saudi Arabia [30] in India (64%) [31] and Iran (48%) [32]. Slightly more than a quarter to the unhygienic surroundings, and only a few to the worm infestation. Mothers with fair knowledge about the cause of diarrhea were reported in a study in coastal Karnataka-India [33]. However, this concept may delay the medical intervention for the serious infectious diseases that are the most common cause of diarrhea in Yemen due to the deteriorating health and living conditions, poor sanitary and hygienic condition, lack of clean drinking water, and widespread internally displaced people camps that lack the most necessities of life.

Considering the knowledge of the dehydration sign, about two-third of mothers were familiar with the lethargy sign. However, recognizing other signs and the thirsty sign was very low (6.8%), meaning significant signs remain unrecognized. A higher per cent (84%) of knowledge about symptoms was revealed in a study in coastal Karnataka-India [33]. A deprived capacity of mothers to recognize the critical sign of dehydration may delay the condition to advanced stages that need intensive medical care. The result was in tandem with the other studies [26,27,34]. The significant finding was poor mothers' knowledge about preventing diarrhea, such as drinking clean water, clean food, handwashing with soap, sterilizing the milk bottle, and increasing the feeding time of milk. Although the result was consistent with the previous study [28], about half of mothers in Iraq knew that good hygiene could prevent diarrhea [35].

The general knowledge of the treatment and preparation of ORS was reasonably low. Only half of the mothers knew using ORS and that it could replace the lost fluids and treat diarrhea. The correct use of ORS is after each liquid diarrhea, but the percentage of mothers with this knowledge was only 38.6%. The result is

consistent with another study in India [15] and Iraq [35]. Nearly 90 % of the death due to diarrhea can be prevented by proper use of ORS [36]. Only 50.5% of mothers knew that the ORS should be kept for 24 hours, which is lower than a study carried out in India where 77.5% of them knew this information [37]. Some mothers preferred using the traditional remedies for the treatment as an alternative for ORS. The non-popularity of the use of ORS may be due to the unpalatability of its test. Missing the knowledge among mothers was reported in other studies [30-39]. There is a wrong practice of prescribing antibiotics instead of ORS by the health workers [40]. The overall knowledge of the mothers was low in a country suffering from a frequent outbreak of watery diarrhea and cholera with the possibility of an increasing number of cases and death. According to Oxford Committee for Famine Relief [Oxfam] International, Yemen suffered from the world's largest outbreak in 2017, with one million cases reported [41]. There is a possibility of increasing cases due to the continuing war in some cities and the continued displacement of families with the poor sewage system, using contaminated water for agriculture, rainy season, and difficulty in reaching clean water. There should be an awareness campaign for mothers to know the early symptoms of diarrhea and the necessary home management.

#### 4.2 Mothers Attitudes toward Prevention and Management of Diarrhea of their Children

The attitude of mothers about the personal and environmental hygiene factors was generally good, such as washing hands with soaps after defecation, after dealing with defecation of the child, and securing disposable the feces of the child. A study in Eastern Ethiopia indicated that mothers wash their hands before preparing food (67.8%) and 100% after defecation [42]. However, another study in Assossa, Ethiopia, showed a much lower percentage for washing hands before food preparation (11.7%) and after defecation (16%) (43). According to a study in Bangladesh, mothers did not wash their hands before food preparation (60%) and 3.1% after defecation [44].

The mother's attitude about exclusive breastfeeding during the diarrhea was more than half. The finding is consistent with a previous study [28]. However, a study in India reported a high level (90%) of mother attitude toward breastfeeding of a child for the first six months as

a preventive measure [45], and about 98.7% of mothers in a study in Iraq continue breastfeeding during the diarrheal episodes [35]. Breast milk contains many compounds that boost the immune system of children. However, the attitude about the importance of the ORS as an essential or first-line treatment, increasing the amount of fluid, and drinking water during diarrhea was relatively low.

In contrast, a study in a village in Indonesia revealed that about 77% of the mothers had a positive attitude toward treating diarrhea [46]. Continuous fluid administration, breastfeeding and using ORS after each diarrhea are very important to replace the lost fluids and minerals in the body [47]. Good personal hygiene practices, especially handwashing with soap after defecation and safe disposal of the feces, can decrease the frequency of diarrhea by 35% [48]. Although diarrhea is not fatal, it can be managed at home if the mothers have proper knowledge, a positive attitude, and practice during diarrhea. As noted by a study, the attitude was chiefly influenced by social and cultural beliefs [49].

### **4.3 Mothers' Practices on Diarrhoeal Disease Prevention and Management**

Table 4 represents the practice of the mothers in the management of diarrhea; the result indicated that more than 50% of the mothers did not prepare the ORS as required. A study in South Africa on the mothers in the rural areas revealed a similar result (45.9%), while the urban area showed a higher result (67.6%) [50]. A study in India revealed that 74.2% of mothers use ORS to manage diarrhea at home (51). However, a similar result was reported in a study in Eastern Ethiopia with 42.4% mothers using ORS at home [52]. According to Unicef, only 43.0% of children under five years in the developed countries use ORS for diarrhea treatment [53]. A lower percentage of mothers (19.4%) in Iran was reported using ORS (54). Nearly half of the mothers did not know the correct way and volume of preparing the ORS; other studies in rural areas in South Africa [50], Nigeria [55], and India (56) revealed insufficient knowledge about the correct mixing of ORS. However, according to a study in Iraq, about 78% of mothers correctly prepared the ORS [35].

One of the common causes of diarrhea, hospitalization due to diarrheal diseases and death worldwide is rotavirus pathogen [57]. The

rotavirus vaccine was licensed in Yemen in 2012. A study conducted in Taiz city to measure the hospitalization rate before and after vaccination showed a significant reduction in diarrheal hospitalization [58].

### **4.4 Study Strengths and Limitations**

This study was restricted to Aden city only. However, its strength was that it covered in detail the knowledge, attitude, and practice of mothers regarding diarrhea and its management. There was no previous study in the city. The information of the current study could be the basis for the interventional education program in the community.

### **4.5 Study Implications**

This study has provided essential findings to be considered by the different stakeholders. Therefore, proper basic infrastructures, essential medicines, education and policy, should be provided and implemented to reduce the childhood diarrhea rate and complications.

## **5. CONCLUSION AND RECOMMENDATIONS**

In summary, the study showed a relatively low level of mothers' KAP in preventing and managing childhood diarrhea in Aden-Yemen. Therefore, in addition to educating the mothers, essential infrastructures, medicines, and public health policy must be in place to control the problem.

This finding should get the attention of the health sectors and other related governmental sectors to strengthen the existing health education programs and improving living conditions. Below are a few recommendations:

- 1- The health care workers must spread awareness, knowledge among mothers about breastfeeding and ORS in diarrhea, inform them on signs of dehydration, and proper management with ORS.
- 2- The health workers should also update their knowledge and be trained in the management of diarrheal diseases.
- 3- The government and municipality should take care of environmental hygiene, provide clean water for drinking, sanitation, and continuous supply of electricity to save the foods properly.

- 4- There must be awareness of diarrhea, its causes, and ways to prevent it through the various media.
- 5- Provide ongoing educational community campaigns in schools, displaced people camps, health centers, and workplaces.
- 6- Rotavirus vaccination campaigns must be continued, and awareness should be raised on its importance.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT AND ETHICAL APPROVAL

The study protocol was endorsed by the Ethics Research Committee of the Faculty of Medicine and Health Sciences, University of Aden. Written informed consent was obtained from all participants who were willing to participate in the study after the objectives, importance, and benefits of the research and voluntary participation were mentioned. They were assured that all the data gathered would be handled with complete confidentiality and used only for research purposes.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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