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Water Handling, Sanitation, and Hygienic Practices and Its Association With Under-five Childhood Diarrhea Among Households of Kirkos Sub City, Addis Ababa, Ethiopia

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Abstract

Background: Diarrheal disease is the second leading cause of death in children under five years old. It is more than 90% is due to poor sanitation, poor hygiene, and unsafe drinking water. This research is aiming to assess the water handling, sanitation and hygiene practices of mothers/caregivers and its association with under-five childhood diarrhea in Addis Ababa.

Methods: A community-based cross sectional study was conducted from April – May, 2016 to selected eligible mothers/caregivers. Data was used Epi Info 3.5.1 software and SPSS V.20 for further analysis. Binary Logistic regression analysis was used to determine COR and 95% CI. Variables with p-value <0.20 in the bivariate analysis were entered in to multivariate analysis.

Result: The overall prevalence was 13.6% with 95% CI (10.4-16.9) which was associated with household income level [AOR: 7.21, 95% CI (1.49, 34.92)], water storage duration [AOR: 5.10, 95% CI (1.47, 17.62)], hand washing facility [AOR: 5.70, 95% CI (1.01, 32.247)], maternal history of diarrhea [AOR: 8.03, 95% CI (1.32, 48.67)] and presence of uncollected garbage in the compound [AOR: 3.42, 95% CI (1.38, 8.49)].

Conclusion: The two-week period under five diarrhea was relatively high and lower income level, storing water for more than a week, lack of hand washing facility, uncollected garbage in the compound, and mother/caregiver history of diarrhea were variables associated with the occurrence of diarrhea.

Keywords: Prevalence; WASH; Diarrhea; Under-five

Introduction

In under- five years old children, diarrheal disease is the second leading cause of death. It kills around 760,000 under-five children every year [1]. It occurs worldwide. World Health Organization estimated that more than 90% of under-five diarrheal disease is due to poor sanitation, poor hygiene, or unsafe drinking water [2]. World-wide around 1.1 billion people lack access to improved water sources, 2.4 billion have no basic sanitation and low levels of hand washing in many countries [3].

Diarrhea causes about 11% of under-five deaths with nine-tenths of these deaths occurring in Sub-Saharan Africa [4]. The majority of child deaths happen in poor countries of Asia and Africa (90%), where safe water, sanitation, and access to urgent medical care are limited [5]. In Africa, 9% of childhood deaths are associated with diarrhea which remains the second leading cause of under-five mortality attributed to poor water, sanitation, and hygiene [6].

In Ethiopia, 13 percent of children under age five were reported to have had diarrhea and in Addis Ababa the prevalence was 9.4% [7]. In Ethiopia, about 43% have no access to an improved source of drinking water [8].

Although studies on the relationship between WASH factors and the occurrence of diarrhea in under-five children have been conducted and documented elsewhere, there is limited resource in Addis Ababa, Ethiopia, specifically in mothers/caregivers of Kirkos sub city, Addis Ababa City administration. As the primary caregiver to under-five children, mothers'/caregivers' WASH practices are important to minimize the effects of morbidity and mortality associated with diarrheal diseases. Determining the association of these factors with childhood diarrhea helps to find possible intervention methods.

The objective of our study was to assess the water handling, Sanitation and Hygiene practice of mothers/caregivers and the association with under-five childhood diarrhea in households of Kirkos Sub City, Addis Ababa, Ethiopia.

Materials and Methods

The study utilized community-based cross-sectional design. It was conducted in Kirkos sub-city, which is one of the sub-cities found in Addis Ababa town, the capital of Ethiopia. In the subcity there are 11 woredas with the estimated total population to be 264,337, under-five children were 19,369, and households were 41, 682. The study population included mothers who have under-five children or caregivers with under- five children.

Considering a 95% confidence level, 4% margin of error, and taking the design effect of 2, accounting for two-stage sampling and adding 10% for to none response rate, the total calculated sample size was 450. The first stage was selecting 5 woredas using a simple random sampling method. In the second stage, the study units were allocated proportional to the number of under-five children in each woredas.

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Finally, a systematic random sampling technique was used to select the study participants.

The actual data was collected from April to May 2016 using the standard questionnaire and an observational checklist which was prepared based on WHO and EDHS core questionnaires related to diarrhea. It was prepared in English and then translated to Amharic and the Amharic also translated back to English to insure consistency. Five data collectors who were health profession were trained in questionnaire administration and data collection procedures. Pretest was done in 5% of the respondents in the other Sub Citys for validation of the questionnaire 15 days prior to actual data collection. The result of the pretest was used to correct some unclear ideas and statements.

Data entry was done using Epi.info version 3.5.1 and data cleaning, editing, and analysis was done using SPSS version 20. Degree of association between dependent and independent variables was computed using logistic regression. To reduce the excessive number of variables and the resulting instability of the model, variables with p-value <0.20 in the bivariate analysis were included in the multivariate analysis. The data was described and presented using narrative Tables 1, 2 and 3.

Table 1: Demographic and socio-economic characteristics of the respondents in Kirkos sub city, Addis Ababa, Ethiopia, 2016 (n=450).

Variable name		Frequency	Percent
Relationship of the respondent to the child			
	Mother	396	88.00%
	Caregiver	54	12.00%
Marital status of the mother/caregiver			
	Not Married	119	26.40%
	Married	331	73.60%
Education of the mother/caregiver			
	No education	105	23.30%
	Primary and above	345	76.70%
Ethnicity of the mother/caregiver			
	Amhara	174	38.70%
	Oromo	125	27.80%
	Tigre	71	15.80%
	Gurage	50	11.10%
	Others	30	6.70%
Employment status of the mother/caregiver			
	Not working	176	39.10%
	Working	274	60.90%
Average monthly household income			
	Less than 1000birr	134	30.80%
	1001-2000	77	17.70%
	2001-3000	129	29.70%
	More than 3000	95	21.80%
Employment status of the father			
	Not working	9	2.60%
	Working	342	97.40%
Educational status of the father			
	No education	34	9.70%
	Primary and above	317	90.30%
Number of household members			
	Five and less	370	82.20%
	More than five	80	17.80%
Age of the child			
	Less than 6		4.40%
	11-Jun		14.00%
	23-Dec		11.80%
	24-35		19.60%

Table 2: WASH characteristics of the respondents in Kirkos sub city, Addis Ababa, Ethiopia, 2016 (n=450).

Variable name		Frequency	Percent(%)
Location of the drinking water source			
	In own dwelling	71	15.80%
	In own yard/plot	310	68.90%
	Elsewhere	69	15.30%
Is the drinking water storage container covered always			
	No	28	6.40%
	Yes	409	93.60%
Removing water from drinking water storage container			
	Dipping	187	35.40%
	Pouring	341	64.60%
How long water stored			
	For a day and less	173	40.00%
	Between day and Week	154	35.60%
	More than week	105	24.30%
Hand washing when and how			
	Before feeding the child with water and soap	55	12.20%
	Before eating food with water and soap	213	47.30%
	Before preparing food with water and soap	201	44.80%
	After cleaning child bottom (nappy) with water and soap	89	19.80%
	After latrine use with water and soap	176	39.10%
Uncollected garbage seen in the compound			
	No	246	54.70%
	Yes	204	45.30%
Type of material the wall of the house made of			
	Mud	233	51.80%
	Cement	204	45.30%
	Wood and other	13	2.90%
Is the toilet facility shared with other households			
	No	200	
	Yes	250	
Child faces disposal			
	Unsafe disposal	102	
	Safe disposal	348	

In Table 1 of the total 450 households, 394(87.6) pipe water, followed by 53(11.8%) public tap/standpipe and 19(4.2%) bottled water sources were their main drinking water sources. More than three-fourths of the households 342(76%) had per capita per day water consumption 20 liters or less. One hundred fifty-nine (35.3%) of households treat their drinking water at home. Nearly all households stored drinking water; most of them 341(77.9%) used jerry cans, 181(41.3%) used bucket and the remaining used clay pots and other materials. About child feces disposal, 348 (77.3%) used the safe disposal method. Three hundred fifty-four households, 78.8% did not have a hand washing facilities inside the latrine or within 10meter. More than half of the households used pit latrines without slab/open pit latrine followed by 18.7% flush/pour flush latrines and 3(0.7%) households did not have latrines or use open field.

Diarrhea was defined as having three or more loose or watery stools in a 24-hour's period in the household within the two weeks period prior to the survey. Ethical clearance was obtained from the ERB/C of AMC, Department of MPH. Permission was sought from Addis Ababa City Administrative Health Bureau and a formal letter was written to Kirkos Sub City and this official written letter was distributed to all woredas. Full verbal consent was obtained from the study participants (mothers/caretakers of the child) after a clear explanation was given about the aim of the study. Confidentiality and privacy was maintained

Table 3: Multivariate result: Demographic and socio-economic and environmental characteristics which are significant in multivariate analysis in Kirkos sub city, Addis Ababa, Ethiopia, 2016.

Variables		Diarrhea (n=450)		COR (95% C.I)	AOR (95% C.I)
		YES (%)	NO (%)		
Average monthly household income	Less than 1000birr	28(20.9%)	106 (79.1%)	3.91(1.55, 9.88)	**7.21(1.49, 34.91)***
	1000-2000	12(15.6%)	65 (84.4%)	2.73(0.97, 7.67)	**4.80(1.04, 22.10)**
	2001-3000	12(9.3%)	117 (90.7%)	1.52(0.55, 4.21)	1.65(0.36, 7.37)
	More than 3000	6(6.3%)	89 (93.7%)	1	1
Duration of drinking water stored	One week and above	24(22.9%)	81 (77.1%)	3.21(1.55,6.65)	**5.10(1.47, 17.62)***
	More than a day and less than a week	22(12.7%)	151 (87.3%)	1.58(0.76,3.25)	2.81(0.88, 8.98)
	One day and less	13(8.4%)	141 (91.6%)	1	1
Treating water at home	No	48(16.5%)	243(83.5%)	2.21(1.16, 4.23)	0.54(0.18, 1.61)
	Yes	13(8.2%)	146(91.8%)	1	1
Latrine facility shared with other households	Yes	45(18%)	205(82.0%)	2.52(1.38, 4.61)	1.43(0.47, 4.38)
	No	16(8%)	184(92.0%)	1	1
Hand washing facility	No	56(15.8%)	298(84.2%)	3.38(1.31, 8.70)	**5.70(1.01, 32.24)***
	Yes	5(5.3%)	90(94.7%)	1	1
Washing hand with soap after using latrine	No	49(17.9%)	225(82.1%)	2.97(1.53, 5.77)	1.86(0.68, 5.04)
	Yes	12(6.8%)	164(93.2%)	1	1
Uncollected garbage seen in the compound	Yes	40(19.6%)	164(80.4%)	2.61(1.48, 4.59)	**3.42(1.38, 8.49)***
	No	21(8.5%)	225(91.5%)	1	1
Mothers/caregivers history of diarrhea	Yes	17(42.5%)	23(57.5%)	6.15(3.05, 12.39)	**8.03(1.32, 48.67)***
	No	44(10.7%)	366(89.3%)	1	1
*P-value less than 0.05 (associated variables)					

during data collection and analysis in which the information obtained from the respondents was not shared with anyone other than the data collectors and the principal investigator.

In Table 2 After controlling potential confounders using logistic regression, some independent variables were found to be statistically significant. Household income, drinking water storage duration, hand washing facility, maternal history of diarrhea, and uncollected garbage in the compound were the independent variables that showed significant association with under-five diarrhea. According to the result, strong association was seen in storing drinking water for a longer period and the presence of uncollected garbage in the compound.

The odds of getting diarrhea was 7 times higher in children from a household whose average monthly income was less than 1000 [AOR: 7.21, 95%CI (1.49, 34.92)] compared to children from a household whose average monthly income range is more than 3000. The risk of diarrhea in children who mothers/caregivers store drinking water for more than a week had 5 times higher odds of diarrhea than children with those mothers/caregivers store drinking water for less than and equal to one day [AOR: 5.10, 95% CI (1.47, 17.62)]. Children from households that had no hand washing facilities in the latrine or within 10 meters had about 6 times higher odds of experiencing diarrhea than those children from households that had a hand washing facilities in the latrine or within 10 meters [AOR: 5.70, 95% CI (1.01, 32.247)].

Likewise, children from the household that uncollected garbage seen in the compound had about 3 times higher odds than children from the household where uncollected garbage was not seen in the compound [AOR: 3.42, 95% CI (1.38, 8.49)].

Children who mother/caregivers had a history of diarrhea within the two weeks preceding the study had 8 times higher odds than those children who mother/caregivers had no history of diarrhea within the two weeks preceding the study [AOR: 8.03, 95% CI (1.32, 48.67)].

Result

A total of 450 mothers/caregivers with under-five children were included in the study with a response rate of 100%. The majority of the respondents 396(88%) were the children's biological mother. Mean age of the mother/caregivers of the children was 33.2(±5). The mean family size was 4.2(±0.14). Three hundred sixty-six (81.3%) of the households had 1under-five children, 17.3% had 2 under-five children, remaining 1.3% had 3 under-five children.

Two hundred twenty-six (50.2%) of the under-five children were females with the majority of the children 226(50.2%) were in age group more than 35 months. In this study, 61[13.6% CI (10.4-16.9)] of the children had experienced diarrhea in the two weeks period prior to the study.

Discussion

This study shows that the prevalence of diarrhea among under-five children is higher. The prevalence was 13.6%. The magnitude of under-five diarrhea in this study is consistent with EDHS 2011 report (13%), country wide [7], and studies conducted in Hawassa (9% in model and 14% in non-model HHs) [9] and west Gojam zone (18%) [10].

However, this is relatively high compared to Addis Ababa region (9.4%) according to EDHS (7) and relatively low compared to studies conducted in Benishangul-Gumuz (22.1%) [11], Assosa District (33.2%) [12], Debrebirehan (31.7%) [13], and in rural Burundi (32.6%) [14]. This difference with Addis Ababa EDHS report could be due to seasonal variation since this study is conducted in short term rainy season the prevalence might increase and it is supported by a study conducted Kashmir, India that showed the prevalence of diarrhea being higher in rainy season (summer) because in hot and humid weather, the growth of pathogenic organisms in the food and other material will increased [15]. The discrepancy in magnitude with other studies could be due to the difference in study design, socio-demographic, basic environmental, and behavioral characteristics of the respondents.

Furthermore children in urban areas where proper sanitation and water are available, and where modern treatment is more frequent will have a lower prevalence of diarrhea.

The main drinking water source was pipe water (87.6%), 90.9% cover their drinking water storage, and 64.7 % do not treat water at home. About 69.2% had an unimproved latrine facilities and 55.5% share their latrines with others households. Less than 50% of mothers/caregivers reported that they had washed their hands after latrine use.

This finding was comparable with mini EDHS 2014 which out of urban households 87% used pipe water, 58 percent in urban areas had unimproved sanitation facilities, and 44.4% pit latrine [8] and the study done on sanitation facilities which found most people in urban slums (88.6%) used unimproved sanitation facilities [16]. However, it contradicts with the study conducted in Burundi which showed public tap was the most common source of drinking water [14]

This result lower level of household income (less than 1000birr per month) was consistent with a study conducted in Sheko district rural community [17], in Wolaita Soddo Town [18] and in Ibadan, Nigeria [19]. Diarrhea often links with hygiene, water, and sanitation. The rich families might have used soap for hand washing, aqua-guard at their houses and constructed improved toilets, however low-income families suffered from this disease because they can't afford these things [20]. Contradicting result was found in the study done in Tiko Cameroon which was lower household income was not significant [21].

The risk of experiencing diarrhea in under-five children was higher in households who stored drinking water for a longer periods. This finding was supported by the result of a study conducted in Tanzania that showed contamination of stored water was associated with longer-term water storage [22]. Other literatures also showed that chlorine level will drop in a few days unless you keep adding chlorine to the stored water [23]. According to grid news posts; crystal clear water can have dangerous bacteria growing in it, or even chemical run-off [24]. The chance exposure to contamination may also increases.

Children from households that lack a hand washing facilities in the latrine or within 10 meters had higher odds of experiencing diarrhea. This result is consistent with the study conducted in Eastern Ethiopia [25]. According to California Childcare Health Program Health and Safety Notes, hand washing is the most important line of defense for both caregivers and children in preventing the spread of diarrhea [26]. This result contradicts with the study conducted in Hawassa, where lack of hand washing facility was not significant [9], and rural Burundi [14].

This result is consistent with a study conducted in Salvador, Brazil (3.98) [27], in Mana district, Jimma [28], and in the study done in Vellore, India, uncollected garbage close to home was significant risk factor for high fly density and diarrhea was associated with fly density [29] .

One of the variables that showed a significant association prevalence of under-five diarrhea was maternal history of diarrhea within two-week period preceding the study. This result is consistent with studies done in Hawassa [9], in Mecha district, West Gojam [10], and in Debrebirehan [13]. This is so because mothers are food handlers of the family, and they are usual childcare providers. Moreover, the care of the child may be compromised if the mother herself is sick [30]. Mother's exposure to diarrhea may also indicate poor hygienic practice in the household that results in disease incidence for the child/children [10].

This study has its strengths and limitations. The strengths include; being a community-based study, can help to detect the true magnitude and factors, and helps to generalize the findings. Using WHO and EDHS core-based standard questionnaire, we can assume that the findings could take a greater proportion of the subjects and consistency in response. Considering multiple contributing factors that affect child health may help use the limited resources more effectively, by identifying the most important risk factors. The limitations of the study include; recall bias may occur on two weeks occurrence of diarrhea and it may under estimate the magnitude as being a cross-sectional study, it was difficult to detect seasonal variations in prevalence under five diarrhea (since it was done in the rainy season it may overestimate the magnitude or might not reflect the actual prevalence).

Conclusion

The prevalence of diarrhea among under - five children was 13.6% and this is relatively high despite the drinking water source and sanitation facility. Finally, we recommend the following preventive measures to alleviate the prevalence of diarrhea among under-five children with important policy implications for health intervention programs and underline the view that the long-term solution could be providing better sanitation.

Early detection of the problem and addressing the risk factors, effective educational programs that emphasize on environmental conditions, strengthen HEP educating mothers/caregivers on sanitation, water handling, hygiene, and proper/sanitary waste disposal through their house-to--to-house visits, encouraging women involvement in income generating activities. Longitudinal studies could be the best designed to assess the prevalence in different seasons.

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