ORIGINAL ARTICLE

Assessment of Diarrheal Disease Prevalence and Associated Risk Factors in Children of 6-59 Months Old at Adama District Rural Kebeles, Eastern Ethiopia, January/2015

Wakigari Regassa[1], Seblewengel Lemma[2]

ABSTRACT

BACKGROUND: Diarrheal disease is the commonchildhood illness and a leading killer of children aged under 5 years, especially in developing countries like Ethiopia. The aim of this study was to assess the prevalence of diarrheal disease and associated risk factors among children of 6-59 months old at Adama district rural kebeles, Eastern Ethiopia.

METHODS: Community based cross sectional study design was conducted in January/2015. Descriptive method was used to describe study variables quantitatively and explanatory method to identify the effect of determinant factors on diarrheal disease occurrence. A single population proportion sample size formula was applied. Random sampling procedure was used by lottery method to select five kebeles and 442 house-holds. Data was collected by using pretested, structured questionnaires through interview and observational checklist by trained data collectors. Double entry was made to epi-info 3.5.3 and & transferredtoSPSS20foranalysis.

RESULT: The two weeks' period prevalence of diarrheal disease in children aged 6 to59 months was 14.7%; 95%CI [11.5-18.1]. mother/caregiver who did not practice hand washing during the critical time was the only factor identified to be significantly associated with AOR=2.2; 95%CI [1.0-4.7] for the child hooddiarrhealdiseaseoccurrenceatAdamadistictruralkebeles.

CONCLUSION: Diarrheal disease prevalence is changed by child's caregiver hand washing practice during critical time. Health education for child's caregiver on hand washing practice during critical time is an important intervention for the prevention of diarrheal disease prevalence among children.

KEYWORDS: sub-Saharan Africa, Ethiopia, diarrhea, children and hand washing

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INTRODUCTION

Diarrheal disease is the common child hood illness and a leading killer of children aged under 5, which accounted for 9% of deaths worldwide in 2015 (1). Most of the deaths from diarrhea occur among children of less than 2 years old living in South Asia and sub-Saharan Africa(1,2). Children who are malnourished, tchildren who have impaired immunity and children with HIV are more at risk of life threatening diarrhea (3).

Globally, 530,000 chilldren under 5 years old are dying in a year due to diarrheal disease. Diarrheal deaths among children of under 5 years old show some change decreased by more than 50%:, from1.2 milliont to half a million and from 2000-2015 worldwide (1). According to the Ethiopian Demographic Health Survey of 2011, diarrheal disease was the first leading cause for 31% of child illness among children of under 5 years old, followed by acute respiratory infection of 7% in Ethiopia (5%). During periods of draught or famine, childhood diarrhea becomes the leading cause of death across all ages in Ethiopia (6).

Globally, in children of under five years age, the higher proportion of diarrheal episodes caused by Rota-virus was 39% and by versus was 20% than that caused by other 4 different pathogens, while the percentage of diarrheal episodes without

Oromia Police Commission Clinic, Oromia, Ethiopia
Corresponding Author: Wakigari Regassa, Email: wagariagga@gmail.com

pathogen was 34% as indicated in previous studies (7,8). Rota virus and Escherichia coli are the two most common etiological agents of child hood diarrhea in developing countries (9). These infectious agents associated with diarrheal disease are chiefly transmitted through the fecal-oral route, especially under unhygienic conditions in rural communies (9). Diarrhea episodes normally occur in under 5 children at an average of 3.2 per child per year (10). It is common in under 3 years old children with high prevalence in 6-23 months of age as identified by a study conducted at Kerssa District in 2013(3).

Diarrheal disease prevalences in children of under 5 years of age in Ethiopia such as EDHS in 2005(25%), EDHS in 2011(13%), Kerssa District in Eastern Ethiopia in 2013(22.5%), Dejen District in Northwest Ethiopia in 2014 (23.8%), Arba Minch District in Southern Ethiopia in 2012 (30.5%) showed the magnitude of child hood diarrhea in Ethiopia (2,3,5,11,12). The prevalence of this problem among this age group in Kashimar, India, in 2008 (25.2%), & in rural Burundi 2014 (32.6%) as indicated by pub med (15,16). Diarrheal disease mortality prevalence varies by region in children under five years of age in Adis Ababa 53 per1000 to a high in Benishangul-Gumuz region 169per1000 children (5). Diarrheal disease morbidity varies in urban-rural community in children under five years of age at Arbaminch, southern Ethiopia, at urban 2.7% while rural 22% (2). The study at Macha District West Gojam, Ethiopia, indicated that there was low diarrheal disease prevalence in children of 0-5 months (8). Although the diarrheal disease mortality reduced by half from 2000-2015 worldwide, the diarrheal morbidity itremains the leading cause of common child illness in developing countries like Ethiopia. This study attempted to determine the diarrheal disease prevalence and associated factors in children of 6-59 months at Adama district rural kebeles. The result of the study can help in diarrheal disease prevention plan.

MATERIALS AND METHODS

Adama District is found at 100kms from Addis Ababa to east. According to data obtained from Adama District Health Office in June 2014, the district has 34 rural kebeles, 9 health centers, 34 health posts. Descriptive method was used to describe the study variables quantitatively while explanatory method was employed to identify associated factors of diarrheal disease occurrence in children. Community based cross- sectional study design was applied by using structured questionnaires through direct interview & observational check list to solicit information from child's mothers/care takers. Single population proportion sample size formula was used, $n= Z^2 \times P(1-P)/d^{2,}$ Where CI = 0.95, Z=1.96, P=22.5, d=0.05. Sample size proportion was taken 22.5 from past study done at kerssa district, eastern Ethiopia 2013. Precision was estimated to be 0.05, design effect 1.5, non-response rate 10% and the total sample size for the study 442 households.

Variables of the study: The variables used by other researchers in their study as a cause and effect for the investigation of diarrheal disease prevalence were also used in this study. Among these variables, the dependent variable was two weeks' prevalence of diarrheal disease[yes, no) while the independent variables were socio-demographic variables, child's age and sex, maternal /caregiver's educational status and marital status. Environmental variables like availability of latrine, latrine utilization determined of human feces presence around house, cleanness of latrine, source of drinking water, presence of hand washing facilities, waste disposal method and child stool disposal method were investigated. Behavioral variables such as hand washing practice, health knowledge, breast feeding practices and child immunization status were studied to determine their effects on diarrheal disease occurrence in children.

Operational definition

Diarrhea is defined as a child with loose or watery stool for three or more times during a 24-hour period. Frequent passing of formed stool is not diarrhea, nor is the passing of loose pasty stools by breast-fed child.

Diarrheal disease occurrence is diarrheal disease prevalence in two weeks' period duration prior to the study time among children of 6-59 months was identified by child's mothers'/caregivers' report of their children diarrheal disease history.

Caregiver hygiene is personal hygiene of the caregivers like short finger nail cut or long finger nail which could be factors for the occurrence of diarrheal disease among children.

Appropriate hand washing practice is the way of child caregiver hand washing practice which shows clean hand palm, fingertip and between-fingers

observed by data collectors to determine its relationship with the occurrence of diarrheal.

Hand washing facility refres to households having hand washing facilities like plastic or metal with water seated nearest to latrine for children to wash their hands after latrine utilization as observed by data collectors.

Hand washing during critical time refers to caregivers' hand washing practice after utilization of latrine, before food preparation and child-feeding as identified by caregivers' oral report of their practice to identify its relationship with diarrheal occurrence.

Sampling procedures: The total number of rural kebeles in Adama district and that of house holds of each rural kebele with children of under five years were taken from Adama District Health Office. By using multi-stage sampling procedure, study samples were randomly selected by lottery method to prevent sample selection bias. Th samples were taken from 34 Adama district's rural kebeles: 5 kebeles were randomly selected, and from these kebeles, 1005 households having children aged 6-59 months registered. Of these, 442 households were selected by lottery method.

Data collection procedure: The data was collected using pretested structured questionnaires prepared based on the WHO/ UNICEF core questionnaires (18) consisting of socioeconomic, environmental and behavioral variables of the study subject. The questionnaires were prepared in English language and translated in to the local language Afaan Ormoo so that the respondents could understand easily. They was also back-translated into English language for analysis. Questionnaires were administered by direct interview and observational checklist by data collectors to solicit information from childrens' caretakers. Observational checklist was used only at interview time on child's cargiver's hand washing practice, caregiver's hygienic condition snd environmental cleanness as well as presence of latrine and its cleanness. The data was collected through home-to-home travel by 11 trained data collectors and 5 supervisors. Then, the collected data was checked for completeness and recoded sequentially for data entering.

Data analysis procedures: The data entry was made using epi-info software version 3.5.3 to prevent data entry error and transferred to SPSS software version 20 for the analysis of study variables by using descriptive statistics and logistic regression of bivariate and multivariate analyses (19). To reduce excessive number of variables in multivariate analysis, the predictor variables (only $P<0.25$) were taken as a candidate and transferred to multivariate analysis to identify the statistically significant factors. The variables with $P <0.05$ in multivariate analysis were taken as statistically significant for diarrheal disease occurrence.

Ethical consideration: Ethical clearance for the study was granted by the Ethical Review Board of Adama Science & Technology University (ASTU) and Addis Continental Institute of Public health (ACI PH). A formal letter was taken from Adama Science & Technology University to Adama Dstrict Health Office. Permission letter was obtained from Adama District Health Office and taken to the selected kebeles' leaders for the study. During data collection, after explanation of the objective of the study, informed written consent was taken from each study participant.

RESULTS

The diarrheal disease prevalence and associated risk factors study was conducted at Adama district rural kebeles on children of 6-59 months (a total 442 house-holds with the 100%response rate). From the total of 442 studied children 65(14.7%) them had diarrheal disease prior to the study in two weeks of study duration.The mean age of these children was 22.4 months with SE +/-0.6 at 95% CI [21.2-23.5].

The mean age of children with diarrhea was 19.7 months with+/-1.5 at 95%CI [18.2-21.2], in contrast to the mean age of children with no diarrhea 22.8 months with+/-0.6 at 95% CI [22.2-23.4]. From 442 children, 205(46.4%) were on breast-feeding, 263(59.5%) started supplementation food at 6 months of age and 413(93.4%) completed immunization. From the total of 442 respondents, 433(98%) were childrens' mothers, 313(70.8%) had no formal education and 333(75.3%) were health extension model family. Of the total, 295(66.7%) households used protected water, 238(53.8%) caregivers practiced proper child stool disposal, 274(62%) house hold had latrine , 256(57.9%) households had no hand washing facilities and 311(70.4%) caregivers bad unhygienic condition.

Associated factors of childhood diarrhea analyzed by bivariate analysis: Table1 shows the study subjects' socio-demographic variables analyzed by using bivariate analysis. Child 12-23

months age with P<0.05, COR=2.6[1.2- 6.0]95%CI was only statistically significant for the occurrence of childhood diarrhea. According to this result, children whose ages are between 12-23 months are likely to be affected by diarrheal disease 2.6 times higher than those aged below 12 months and above 23 months.

Table 1: Socio-demographic factors for the diarrheal occurrence among children of 6-59 months old (N=442) analyzed by bivariate logistic regression analysis, Adama district rural kebeles, January 2015.

Study variables		Diarrhea N=442 yes / NO		COR [95%CI]
Child's age	36-59months	11	99	1
	6-11months	24	101	2.117[0.984-4.553]
	12-23months	21	78	2.640[1.169-5.962]*
	24-35months	9	100	0.883[0.458-1.701]
Child's sex	Male	39	193	1
	Female	26	184	1.430[0.837-2.444]
Child's care giver	Mother	62	371	1
	Other	3	6	2.992[0.729-12.276]
Child's care giver education	Secondary &above	5	20	1
	Have no formal education	45	268	1.489[0.532-4.169]
	Elementary	15	29	1.483[0.483-4.557]
Child's care giver marital status	Married	54	325	1
	Unmarried	10	29	0.482[0.222-1.045]
	Widowed	1	23	1.822[0.506-28.887]

* Statistically significant with P<0.05, COR = Crude odd ratio, CI-confidence interval.
HH- households, N=total population studied

Table 2: Environmental factors for the diarrheal occurrence among children of 6-59 months old (N=442) analyzed by bivariate logistic regression, Adama district rural kebeles, Estern Ethiopia, January/2015

Study variables		Diarrhea N=442 yes / NO		COR [95%CI]
HH drinking water source	Protected	39	256	1
	Un protected	26	121	1.410[0.821-2.424]
Distance of drinking water	≤30minuteroundtrav	41	197	1
	>30minuteroundtravel	24	180	1.561[0.907-2.686]
Animal presence in HH	No	43	275	1
	Yes	22	102	1.379[0.787-2.419]
Child stool Disposal	Proper	25	213	1
	Improper	40	164	2.078[1.211-3.564]*
Presence of latrine	Yes	36	238	1
	No	29	139	1.160[0.565-2.383]
HH environment cleanness	Clean	29	228	1
	Not clean	36	149	1.900[1.117-3.230] *
House floor cleanness	Clean	40	275	1
	Not clean	25	102	1.685[0.973-2.917]
Human feces around house	No	29	239	1
	Yes	36	138	2.150[1.263-3.660]*
Animal feces around house	No	26	200	1
	Yes	39	138	1.695[0.992-2.897]
Hand washing facilities presence	Yes	19	167	1
	No	46	110	1.925[1.087-3.411] *

* Statistically significant with P<0.05, COR = Crude odd ratio, CI-confidence interval, HH- households, N=total population studied

Table 2 shows study subjects'environmental variables analyzed by bivariate analysis. Variables those their P<0.05 were unclean latrine COR=2.4[1.2-4.9]95%CI, not presence of hand washing facilities COR=1.9[1.1-3.4] 95%CI, presence of human feces around house COR=2.2[1.3-3.7]95%CI, and improper child stool disposal COR=2.1[1.2-3.6]95%CI,were found to be statistically associated with diarrheal occurrence in children 6-59months of age.

Table 3 shows the study subjects' behavioral variables analyzed by bivariate analysis. Variables those their p<0.05 were, child's care giver not appropriate hand washing practice COR=2.2[1.3-3.8]95%CI, not practiced hand washing during critical time COR=2.6[1.5-4.5]95%CI, and un hygienic condition of child's mother/care giver COR=2.5[1.5-4.3] 95%CI were statistically associated with the occurrence of diarrheal disease in children 6-59 months of age.

Table 3: Behavioral factors for the diarrheal occurrence among children of 6-59 months of age (N=442) analyzed by bivariate logistic regression, Adama district rural kebeles, January/2015.

Study variables		Diarrhea N=442 yes / NO		COR [95%CI]
Care giver health knowledge	Health extension model	48	285	1
	not health extension model	17	92	1.097[0.602-2.001]
Child age started supplementation food	>=6month	31	148	1
	<6month	34	229	1.411[0.831-2.394]
Child weaning age	On breast feeding	20	185	1
	<1year	18	97	2.629[1.402-4.931]
	>=1year	27	95	1.532[0.792-2.964]
Hand washing practice during critical time	Yes	28	250	1
	Some times	6	19	0.9.9[0.334-2.473]
	No	31	108	2.563[1.466-4.480]*
Child's care giver hygiene	Hygienic	34	277	1
	Un hygienic	31	100	2.526[1.475-4.324] *
Care giver appropriate hand washing	Yes	26	224	1
	No	39	153	2.196[1.283-2.758] *
Child immunization completed	Yes	58	355	1
	No	7	22	1.947[0.796-4.765]

* Statistically significant with P<0.05, COR = Crude odd ratio, CI- confidence intervals.
HH- households, N=total population studied

Table 4 displays the study subjects' predictor variables at P<0.25 in bivariate analysis considered as candidates and transferred for multivariate logistic regression analysis to identify statistically determinant factors for the occurrence of diarrheal disease in children of 6-59 months of age. Among variables analyzed by multivariate analysis, only the variable of not practicing hand washing during critical time was statistically significant with AOR=2.2 [1.0-4.7]95%CI for occurrence of childhood diarrhea.

The result of study subjects' predictor variables analyzed by multivariate analysis indicated that child's caregiver who did not practice hand washing during critical time had children being affected by diarrheal disease 2.2 times higher than those children whose caregivers practiced hand washing during critical time. The other variables taken as significant and taken as a candidate for multivariate analysis due to their P<0.25 value were not significantly associated with the occurrence of diarrheal disease in children.

Table 4: Variables related to childhood diarrheal occurrence analyzed by multivariate logistic regression (N=442), Adama district rural kebeles, Eastern Ethiopia, January2015.

Study variables		AOR [95%CI]
Child's age	36-59months	1
	6-11months	0.692[0.287-1.666]
	12-23months	1.633[0.605-4.407]
	24-35months	0.667[0.270-1.647]
HH drinking water source	Protected	1
	Un protected	0.889[0.408-1.936]
Animal presence in HH	No	1
	Yes	1.256[0.612-2.578]
Child stool Disposal	Proper	1
	Improper	1.433[0.723-2.838]
Child weaning age	On breast feeding	1
	<1year	1.376[0.579-3.273]
	≥1year	0.679[0.315-1.464]
Child immunization	Complete	1
	Not complete	1.125[0.412-3.072]
Hand washing practice during critical time	Yes	1
	Some times	0.779[0.265-2.285]
	No	2.221[1.044-4.729] *
HH latrine Presence	Yes	1
	No	1.160[0.565-2.383]
Latrine cleanness	Clean	1
	Un clean	1.193[0.486-2.929]
HH Environment Cleanness	Clean	1
	Unclean	0.826[0.362-1.885]
Care giver's hygiene	Hygienic	1
	Un hygienic	1.622[0.735-3.578]
Caregiver appropriate hand washing	Yes	1
	No	1.061[0.467-2.409]
HH hand washing facilities presence	Yes	1
	No	0.912[0.412-2.021]
Human feces around house	No	1
	Yes	0.670[0.235-1.380]
Animal feces around house	No	1
	Yes	1.256[0.612-2.578]

* Statistically significant with P<0.05, AOR =Adjusted odd ratio
HH- households, CI-confidence interval, N=total population studied

DISCUSSION

The result of this study showed that the variable statistically identified as associated factor for occurrence of diarrhea was also identified in other studies conducted in Arba-Minch District in Southern Ethiopia in 2012 (2), Dejen District in Northwest Ethiopia in 2014 (12), Kerssa District in Eastern Ethiopia in 2013(3) and Sheko District rural kebeke in Southwest Ethiopia in 2014 (13). According to this result diarrheal disease prevalence was lower than the proportion of 22.5% identified in a previous study in 2013 in Kerssa District of Eastern Ethiopia (3), and higher than the study conducted at Walita Sodo Town, Southern Ethiopia in 2015 with the diarrheal disease prevalence of 11% (14). But relatively similar with diarrheal disease prevalence of 13% found in a study conducted by Ethiopian Demographic Health Survey of 2011 on children of under five years of age (5). Depending on the result of this study diarrheal occurrence was 3.8 episode per child per year occurring in children of 6-59 months old in Adama district rural kebeles. This is relatively higher than the ocuurrences of 3.2 episode per child

per year likely to occur in children under five years of age (10), as indicated in other studies.

In this study, it was found that hand washing practice of child's caregiver and environmental hygiene were important risk factors for diarrheal disease occurrence. There is a possibility of contacting with diarrheal pathogens where there is unclean environment. Therefore, it opens an opportunity for pathogens transmission since the infectious agent associated with diarrheal disease is transmitted chiefly under the unhygienic conditions (8,10). As this study result showed the lower of the diarrheal disease might be due to majority of child's care giver (75%) of them were health extension model family. Majority of children (93.4%)of them completed immunization. Seasonal bias may had a factor due to this study conducted in winter season (15).

The result of this study may help the district health office by implementing health education to bring behavioral change on child's care giver. Hand washing practice after latrine utilization, before food preparation and before child feeding prevent diarrheal disease prevalence in children(7,8,9). The strength of this study was community based study, data entry made by epi info and analysis made by SPSS. But because of cross-sectional study used, observational checklist of data record only at one time might had bias on this study. According to this study result, the prevalence of diarrheal disease was what likes reduced among children of 6-59 months of age. Further investigation needs by including under 6 months of age to investigate the prevalence of diarrhea among children of under five years of age.

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