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Research Article

Frequency of Diarrheal Attack and its Predictors among Infants and Young Children from Akaki Kality Sub-city: A Community Based Study

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Abstract

Background: The frequency of diarrhea is estimated to be around five times on average yearly and it is the second leading cause of child mortality in Ethiopia. The divergence in the attributes operating in the occurrence of diarrhea in the study setting is limited and thus we addressed this gap to generate evidence based intervention. This study aimed to estimate the frequency and predictors of diarrhea among infant and young children.

Method: A community based cross-sectional study was conducted among 422 caretakers', whose infant and young children had experienced diarrhea in Akaki sub city from February to March 2016. Relevant socio-demographic and other important health information were collected using a pre tested structured questionnaire through house to house interview. Data were entered using Epi Info Version 3.5.3 and exported to SPSS version 20 software for analysis. Logistic regression was applied to identify the determinants of diarrhea, and a p-value < 0.05 was considered a statistically significant.

Result: Overall, 333 (78.9%) infant and young children had one episode and the rest 89 (21.1%) had more than one episodes of diarrhea attack. The episode of diarrhea was significantly lower among those who used ventilated improved pit-latrine than pit-latrine with slab and pit-latrine with open slab (AOR = 2.2; 95% CI = 1.02 - 4.74) and (AOR = 1.93; 95% CI = 1.05 - 3.57), respectively.

Conclusion: Three in four infants and young children had one episode of diarrheal attack which is unacceptably high. Although not significantly, focused actions targeting the young age of children shorten the distance to fetch water, access to pit-latrine toilet facility and improved fecal disposal system are needed to lower the incidence of the problem.

Keywords: *Diarrhea; Children Below Five Years; Ethiopia*

Abbreviations

AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; CI: Confidence Interval; FMOH: Federal Ministry of Health; VIP: Ventilated Improved Pit-Latrine; HEW: Health Extension Workers; IYC: Infant and Young Children; SPSS: Statistical Package for Social Science

Introduction

Despite the Integrated Management of Childhood Illness (IMCI) initiative, which is the main framework for child health interventions in developing countries, still diarrheal attacks takes many lives of children. Nearly nine million children under five years of age die each year in developing world while in developed world an estimated 1.5 million under-five deaths observed every year [1] and this is the leading cause of child morbidity and mortality in Sub-Saharan Africa, a region where unique geographic, economic, political, socio-cultural, and personal factors interact to create distinctive continuing challenges to its prevention and control [2].

According to the World Health Organization (WHO) and UNICEF, every year about two billion cases of diarrheal disease occur and nearly 1.9 million of them die with the occurrence being the highest in developing countries.

Globally, diarrhea of any sort is the second leading cause of death second to pneumonia, among the under–five year children with the greatest hit during infancy period with a minimum of five times attack on average annually. Most of the etiologies attributed to acute diarrhea are poor sanitation and hygiene practices, potable water handling, food storage and under nutrition are among others [1-3] indicating that the etiologies are heterogeneous and these circumstances make the issue a challenging clinical condition [4].

According to the Ethiopian Demographic and Health Survey (EDHS) 2016, diarrhea was most common among infants aged 6-11 months (23.0%) [5] and the previous EDHS 2011 indicated that 13.0% of under-five year children had diarrhea, with more cases from households whose main source of drinking water is from unprotected wells (18.0%) [6]. Another recent study in the country also reported a prevalence of diarrhea of 14.5% [7]. Subsequent studies conducted in Northern and Eastern Ethiopia also reported a little bit higher of acute diarrheal attack of 18% [8] and 33.2% [9], respectively in the same age group categories.

Given the high burden of the problem, the government of Ethiopia initiated several intervention strategies since 1990 on wards to reduce the incidence and also lower diarrhea related deaths among under-five mortality rates by two-thirds [6]. The main framework within which the current child health interventions strategies being implemented is the Integrated Management of Childhood and newborn Illnesses [8,9] which is similar strategies to other developing countries. Other than this, zinc bundled with ORS is endorsed in the ministry as an additional initiative in the management aspect of diarrhea for the under-five year children [10,11].

Previous limited studies conducted in the present study site uncovered the existence of the problem though the extent of the information lacks the attributes contextually which are important. Therefore, we examined the frequency of diarrheal attack and its attributes among infants and young children to generate evidence based information for plausible interventions.

Methods

Study area and population

A community based cross-sectional study was conducted in Akaki Kality sub-city of Addis Ababa from February to March 2016. The sub city is among the ten sub-cities with high burden of diarrhea in the capital city of Ethiopia which constitutes 11 districts of which, 8 are urban and were home for 224,370 people with female population being 51.5 percent. The sub city had 6 Government owned and one private health centers [6]. We purposively selected 3 districts that had reported high figure of diarrhea. All caretakers who had infant and young children (IYC) and had sought treatment for diarrhea in the last three months prior to the study were identified from all facilities in the sub-city and included in the study.

Sample size determination and sampling procedures

The sample size was determined using single proportion formula based on the estimation of the proportion of diarrhea in the study area, which was 50.0% [6], absolute precision of 5.0% and a 95% level of confidence with a non-response rate of 10% yielded a total of 422 subjects.

To sample the households, the sampling frame obtained from the health facilities was divided by the sample size and accordingly, every fifth household with a random start was selected from the sampling frame until the required sample size was reached. The sampled households were then traced their place of residence through the female health extension workers and were enrolled after their verbal consent was obtained based on the inclusion criteria (caretakers with IYC who sought diarrheal treatment and permanent resident).Each voluntary caretaker from the respective households was interviewed face to face at their home at their convenience.

Data collection instrument and procedure

Data were collected using a pre-tested structured questionnaire by reviewing previous similar studies conducted that captured the study objectives. The questionnaire included information on socio-demographic/economic characteristics, caretakers practice regarding their source of water for drinking and cooking food and other household hygienic practices. Eleven data collectors comprised of Health extension workers (HEWs) and graduate nurses fluent in the local languages and two supervisors (Health Officers) with relevant experience were recruited and trained for two days by the investigators on the method of the data collection. The training addressed issues such as the content of the questionnaire, basic interviewing skills, and filling out of the questionnaire.

Data quality management

The quality was observed at different levels and included the followings: due emphasis was given to questionnaire designing to capture the objectives of the study, logically sequenced, free of scientific terms and non-leading structured questionnaire and pre-tested on 5% of caretakers in non-sampled districts of the sub-city. The data collectors and supervisors were trained on the objective of the study, contents of the questionnaires and how to maintain confidentiality and privacy of the study subjects. The collected data were checked by the investigator on daily basis for any incompleteness and/or consistency and timely action was made.

Statistical analysis

Data were checked for completeness, coded, and entered using Epi-Info version 3.5.3 and then exported to SPSS version 20 for cleaning and analysis. The results are presented in percentages and tables/graphs where appropriate. Binary logistic regression was employed to examine the associations between socio-demographic variables and the outcome variables (episodes of diarrhea). To ascertain the association between the dependent variables and the explanatory variables, simultaneously controlling for the aforementioned explanatory variables, (all socio-demographic characteristics and other covariates associated in bivariate with $p < 0.2$ were used and entered) stepwise logistic regression was applied and adjusted odds ratios (AORs) and confidence intervals (95% CI) were calculated. In all analyses, $P < 0.05$ was considered to be statistically significant.

Operational definitions

- **Acute diarrhea:** An abnormally frequent discharge of semisolid or fluid fecal matter from the bowel, lasting less than 14 days.
- **Caretaker/caregiver**: A person/mother who brought the child to health center and give care.
- **Episode**: Frequency or number of attack of infants or young children by diarrhea.
- **Hygiene**: conditions and practices that help to maintain health and prevent the spread of diseases.

Result

All caretakers recruited were interviewed and responded to all the questions with 100.0% response rate. The proportion of children who had one episode of attack was 78.9% and the rest 21.1% had more than one episode of diarrheal attack (Figure 1).

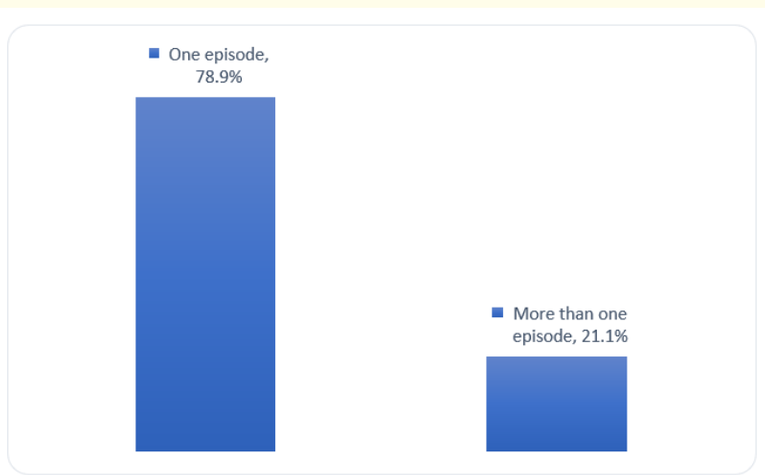

Figure 1: *Episodes of diarrheal attack among infants and young children in Akaki Kality-Ethiopia, 2016.*

Of the 422 participants, 214 (50.7%) were in the age range of 7-23 months and 218 (51.7%) were females. The majority 340 (80.6%) have piped water into their dwelling for drinking and cooking purpose within less than fifteen minutes to access. The vast majority (96.0%) didn't add anything to make water safer to drink while 6 (1.4%) added bleach chlorine and 11 (2.6%) added water guard or aqua tabs to make the water safer to drink. Almost two third of participants (60.9%) stored their drinking water in bucket/Jerikan with cover (Table 1).

Characteristics	Frequency	Percent
Had piped water as source of drinking		
Piped into dwelling	340	80.6
Public tap/stand pipe	82	19.4
Used piped water as a source of cooking water		
Piped into dwelling	340	80.6
Public tap/stand pipe	82	19.4
Location of water source		
In own dwelling	340	80.6
Elsewhere	82	19.4
Time taken to fetch water (back and forth)		
Less than 15 minutes	340	80.6
More than 15 minutes	82	19.4
Added substance to make water safe for drink		
Yes	17	4.0
No	405	96.0
Make water safer to drink		
Add bleach chlorine	6	1.4
Add water guard/aqua tabs	11	2.6
Nothing is added	405	96.0
Storage of drinking water		
Pot with cover	8	1.9
Bucket /Jerikan with cover	257	60.9
Bottle and put them in the refrigerator	94	22.3
Other	63	14.9

Table 1: *Source of water for daily utilization of participants in Akaki Kality, Addis Ababa -Ethiopia, 2016.*

As shown in table 2, all participants had varieties of latrine and toilet facility at household level; of these, 27 (41.5%) flush to piped sewer system, 12 (18.5%) flush to septic tank and 26 (40.0%) flush to pit-latrine. About two thirds (63.3%) had ventilated improved pit-latrine, 43 (12.0%) had Pit-latrine with slab and 88 (24.6%) had Pit-latrine slab/open toilet facility. The majority (86.3%) of households used shared toilet facility. Hand washing was practiced among 182 (43.1%) before feeding the child, 119 (28.2%) after the child defecated and 46 (10.9%) before eating. Almost half of the children (51.9%) defecated into chamber pot without a lid while 199 (47.2%) defecated into chamber pot with a lid. Most (83.4%) disposed the fecal material appropriately while 50 (11.5%) of them threw it into garbage. It is interesting to note that 335 (79.4%) of them cleaned the child using wipes and wash them with soap and water after defecation.

Characteristics	Frequency	Percent
Had latrine?		
Yes	422	100.0
No	0	0
Household with flush or pour flush toilet facility		
Flush to piped sewer system	27	41.5
Flush to septic tank	12	18.5
Flush to pit-latrine	26	40.0
Household with pit-latrine toilet facility		
Ventilated improved pit-latrine	226	63.3
Pit-latrine with slab	43	12.0
Pit-latrine slab /open	88	24.6
Household with shared toilet facility		
Yes	364	86.3
No	58	13.7
Number of HH used shared toilet facility		
Less than 10 HH	336	92.3
Greater than 10 HH	25	6.9
Don't know	3	0.8
Condition of washing hands		
Before eating	46	10.9
Before feeding my child	182	43.1
Before breast feeding my baby	33	7.8
Before cooking	6	1.4
After visiting toilet	36	8.5
After caring for child who has defecated	119	28.2
Place where a child defecated		
Bare ground at the compound	4	0.9
Into chamber pot without a lid	219	51.9
Into chamber pot with a lid	199	47.2
Disposed the feces of the child		
Child used toilet	11	2.6
Put/rinsed into toilet or latrine	352	83.4
Thrown into garbage	50	11.8
Put/rinsed into drain or ditch	9	2.1
Cleaned the child after defecation		
Usedwipe	55	13.0
Used any harmless object	32	7.6
Use tissue paper and wash anal area with soap and water	335	79.4

Table 2: *Hygienic practice of participants in Akaki Kality, Addis Ababa -Ethiopia, 2016.*

Table 3 indicates that age of children, gender of children, time taken to get water, household with pit-latrine/toilet facility and disposal system of the feces of the child were crudely associated in the binary logistic regression. Nonetheless, after adjusting for the confounding factors, only household with pit-latrine/toilet facility remained a predictor. Thus, children from households with pit-latrine with slab and pit-latrine with slab (open) were 2.2 (AOR = 2.2; 95% CI = 1.02 - 4.74) and 1.93 (AOR = 1.93; 95% CI = 1.05 - 3.57) times more likely affected by diarrheal attack compared with ventilated improved pit-latrine (VIP).

Characteristics	Episode		COR	AOR
	One	> One		
Age of children	**n (%)**	**n (%)**		
0 - 6 months	56 (86.2)	9 (13.8)	1	1
7 - 23 months	172 (80.4)	42 (19.6)	1.519 (0.696-3.32)	1.44 (0.58-3.59)
24 - 35 months	60 (72.3)	23 (27.7)	2.385 (1.017-5.59)*	2.44 (0.914-6.51)
36 - 47 months	45 (75.0)	15 (25.0)	2.074 (0.831-5.18)	1.56 (0.54-4.51)
Gender of children				
Male	152 (74.5)	52 (25.5)	1	1
Female	181 (83.0)	37 (17.0)	0.598 (0.37-0.96)*	0.61 (0.35-1.04)
Time took to fetch water				
Less than 15 minutes	276 (81.2)	64 (18.8)	1	1
Greater than 15 minutes	57 (69.5)	25 (30.5)	1.89 (1.10-3.26)*	1.73 (0.93-3.23)
Household with pit-latrine/toilet facility				
Ventilated improved pit-latrine (VIP)	189 (83.6)	37 (16.4)	1	1
pit-latrine with slab	30 (69.8)	13 (30.2)	2.21 (1.06-4.64)*	2.2 (1.02-4.74)*
pit-latrine with slab (open)	63 (71.6)	25 (28.4)	2.03 (1.13-3.63)*	1.93 (1.05-3.57)*
Disposed the feces of the child				
Child used toilet	6 (54.5)	5 (45.5)	1	1
Put/rinse into toilet or latrine	278 (79.0)	74 (21.0)	0.32 (0.09-1.08)	0.39 (0.10-1.50)
Thrown into garbage	42 (84.0)	8 (16.0)	0.23 (0.06-0.93)*	0.21 (0.04-1.08)
Put/rinse into drain or ditch	7 (77.8)	2 (22.2)	0.34 (0.05-2.46)	0.45 (0.06-3.60)

Table 3: *Univariate and multivariate analysis for predictors of episodes for infant/young children diarrhea in Akaki Kality, Addis Ababa -Ethiopia, 2016.*

**Indicating associated variable.*

Discussion

Diarrheal disease is a major health problem in resource-poor settings and this study has shown that the frequent episode of attack was found indicating that the problem is more than a health issue as the problem has significant adverse effects on the quality of life of poor households. As seen in this study, more than three-fourth of infants and young children had one episode of diarrheal attack yearly and the situation obviously entailed to some economic burden on the households markedly though we did not examine the impact in this regard. Nonetheless, the burden of diarrhea in this study when compared with the Pakistani study findings [12], it is lower in terms of the frequency where the Pakistani study reported episodes of five times annually. Several attributes which could range from poverty, female

illiteracy, poor water supply and sanitation, poor hygiene practices, and inadequate health services are incriminated to contribute to the very high burden diarrheal morbidity and mortalities [12] and would definitely increase the negative impact of diarrhea on the household markedly.

Treatment of water source for drinking and cooking food is very minimal in this study and is concordant with the study conducted in North Gondar [8] and Pakistan [12]. Very few of respondents in the current study, bleach/ chlorine added to treat drinking water and this finding compared with the EDHS 2016 report is low (1.4% vs 3.2%) underlines the need for more targeted counseling [5]. The lack of running water is thus not only a problem in terms of hygiene and organisms, but also in terms of quality of life and the experience of illness underlines the importance of safe water supply as a high impact intervention. Similarly the hygienic practice observed is again low though comparable with the study findings of Indonesian young children [13] underscores the need for focused interventions.

On the other hand, community water source and water storage container didn't not show significant association in our study unlike the study conducted in Assosa district, Ethiopia which showed a significant association with the episode of diarrhea [9]. This was probably due to the difference in the study setting and the small sample size used in our study.

Washing hands, improving the treatment of stored water, having facilities to dispose children stool are well known measures to prevent infantile and young children diarrheal disease [14]. Other equally important strategies to prevent acute diarrheal episodes are introduction of safe dietary strategies for prevention of malnutrition, and improvements in sanitation and hygiene conditions, including sewage and clean water [15]. Nonetheless, in this study we observed such associations only with toilet facilities and with aforementioned factors probably due to the study settings and the small sample sizes used suggesting for further study to delineate the mere associations.

In this study, feces disposal system was Put/rinsed into toilet or latrine mainly. The presence of latrine facility is very encouraging even though it was shared with a minimum of ten households. The finding concurs with the 2016 EDHS study report which indicated that Ninety-four percent of households used unimproved sanitation of which 9.0% used a shared facility, 53.0% used an unimproved facility, and 32.0% had no facility [5]. Interestingly, right after defecation caretakers cleaned their children with wipes and washed them with soap and water which was an encouraging result in this study.

Conclusion

In conclusion, various pertinent characteristics of episodes of infant diarrhea were addressed in this study. Unexpectedly, only household with pit-latrine toilet facility had a significant association with the episode of infant diarrhea. Other than this, the age and gender of children, time taken to get water, disposal system of fecal materials are other areas that need more work and thus we recommend actions targeting the aforementioned variables to enhance the health of infants and young children, and ultimately reduce the frequency of diarrheal attack in the community.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the School of Public Health Research Ethics Review Committee of Addis Ababa University, College of Health Sciences under protocol number 029/10/SRHB. Permission was also secured from the regional health bureau as well as from the respective district administration and Health Office. Verbal consent was obtained from each caretaker after the objective of the study was explained to all of them in their local language and the right to withdraw from the study at any time was also communicated. Anonymity and confidentiality of the information was assured and privacy of each respondent was maintained throughout the data collection process.

Consent for Publication

Not applicable.

Availability of Data and Material

Data are available from the principal author upon reasonable request and with permission of the Federal ministry of Health, Ethiopia.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

AL reanalyzed the data and prepared the draft manuscript. JH participated from the inception of the project, analyzed the data and wrote the manuscript. SH collected data and wrote the thesis. All authors read, critically revised and approved the final manuscript.

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