

Special Article - Malnutrition

Nutritional Management of Childhood Diarrhoea in Korogocho Slum Nairobi County, Kenya

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Background: Diarrhea is the second leading cause of death in children under five years old worldwide. Diarrhea is the third most common cause of mortality and morbidity in Kenya, with a case fatality of up to 21 percent causing approximately 9 percent of deaths in children less than five years of age. The primary focus of diarrheal disease control programs has been on improved case management through the promotion of oral rehydration therapy, while nutritional management has been relatively neglected.

Objective: The purpose of this study was to determine caregivers' knowledge on nutritional management of childhood diarrhea and assess nutritional status of the children.

Methodology: This was a descriptive cross sectional survey that was carried out in Korogocho slum, Nairobi County. Semi structured interviewer administered questionnaires and focus group discussions were used to collect data. Cluster sampling was used where several steps were taken in selecting the sample. Participants of focus group discussion were selected through purposive sampling. A sample size of 354 caregivers was selected. Chi square was used to test for statistical associations.

Results: Almost a third of the respondents (32.5%) had secondary education. Only 7.3% of caregivers had high level of knowledge on nutritional management of childhood diarrhea. Prevalence of diarrhea was 17.8%. Most of the caregivers (61.3%) gave less amount of solid food, however only 13.9% reduced amount of breast milk. Some caregivers had used food remedies such as sorghum or wheat porridge to manage diarrhea. Underweight, stunting and wasting levels among study children were 16.6%, 29.1% and 7.6% respectively.

Discussions and Conclusions: The level of wasting was higher in children who had diarrhea two weeks preceding the survey (14.29%) compared to those who didn't have diarrhea (6.2%). The study demonstrated that caregivers' were not well informed on optimal feeding, zinc supplementation, and growth monitoring of children during diarrhea.

Keywords: Diarrhea; Nutritional management; Children under five years; Slum

Abbreviations

APHRC: African Population and Health Research Center; EBF: Exclusive Breast Feeding; FGD: Focus Group Discussion; MOH: Ministry of Health; SPSS: Statistical Package for Social Sciences; WHO: World Health Organization.

Introduction

Diarrhea is defined as having loose or watery stools at least three times per day, or more frequently than normal for an individual [1]. It now causes about 11 percent of child deaths worldwide, 90 percent of these deaths occur in sub-Saharan Africa and South Asia [2]. Diarrheal disease cause nearly one in five children deaths-about 1.5 million each year, around 760,000 children are under five. It is second to pneumonia, which together with diarrhea account for almost 40 percent of all child mortality across the globe every year [1]. Africa and South Asia account for more than 80 percent of all child deaths

resulting from diarrhea [3]. In addition, 75 percent of these deaths occur in only 15 countries with Kenya ranked at number 10 in this list [4]. There are three clinical types of diarrhea: Acute watery diarrhea, acute bloody diarrhea also called dysentery and persistent diarrhea [5].

The primary focus of Diarrheal Disease Control (CDD) programs has been on improved case management through the promotion of Oral Rehydration Therapy (ORT), while nutritional management has been relatively neglected [6]. Poor child feeding practices in particular during diarrhea, are important determinants of growth faltering and malnutrition [7]. This study addressed the gap which is the focus on Oral Rehydration Treatment (ORT) of diarrhea without integrating nutrition management to prevent malnutrition.

Children with severe acute malnutrition complicated by diarrhea have a higher risk of death than those who do not have diarrhea [8]. According to the maternal, infant and young child nutrition, national

operational guidelines [9], it is recommended that children less than six months of age should be breastfed more frequently, emptying one breast at a time, take zinc tablets, vitamin A supplement (50000IU) and ORS solution as instructed by the health care worker. Children above six months of age should take extra foods, breastfeeding, fluids, soups, fermented milk, fruit juices and safe water. Children should take small amounts of foods they like most, a variety of nutrient rich foods, breastfeeding and take antibiotics only when there is blood in the stool. After illness or during recovery, the child's nutrition and health status should be monitored every month during recovery period, take extra breastfeeds and use extra rich foods that are energy dense. Children aged 6-8 months should be fed 2 times a day. Children aged 9-11 months should be fed 2-3 meals plus 1-2 snacks preferably fruit or milk based while children aged 12-59 months should be fed on 3-4 meals and 2 snacks preferably fruit and milk [9]. The common causes of acute watery diarrhea are viral, bacterial, and parasitic infections. Rotavirus and *Escherichia coli* are the most common etiological agents of diarrhoea in developing countries [10].

Caregivers play a central role in the effective management of childhood diarrhea. Correct home treatment with oral rehydration and adequate food is crucial to prevent deterioration of the child's condition [11]. Childhood diarrhea is an important cause of malnutrition, which can be worsened when caretakers limit nutritional support. Some caregivers perceive feeding during diarrhea to be harmful. Most caregivers discontinue normal feeding or give less food. Misperceptions of the role of feeding during diarrhea pose a significant health risk for children. Continued feeding during diarrheal episode and continuing or increasing breastfeeding is critical for breaking the vicious cycle of diarrhea and malnutrition [12]. Continued feeding is associated with better clinical outcomes and better recovery of the intestinal function. Thus continuation of feeding during diarrheal episodes is an important component of the Integrated Management of Childhood Illness (IMCI) [13]. The purpose of this study was to determine caregivers' knowledge on nutritional management of childhood diarrhea and assess nutrition status of the children.

Materials and Methods

The study used a descriptive cross sectional design to determine the knowledge regarding nutritional management of childhood diarrhea at home among caregivers of fewer than five years and determine the nutrition status of these children.

The dependent variable was caregiver knowledge on nutritional management of childhood diarrhoea. To measure knowledge, a correct response in the questionnaire was given a score of one, and incorrect one, a score of zero. Percentages using an index of Ashur's criteria [14] were used for describing level of knowledge. By this criterion, below 40 percent score of the respondents was considered low level of knowledge, 40-59 percent was considered average level, a score of 60-80 percent was considered high level, while above 80 percent was considered very high level of knowledge.

Child malnutrition was indicated by three anthropometric indices: height-for-age (H/A), which indicates the level of stunting, weight-for-age (W/A), which indicates the level of underweight, and weight-for-height (W/H) which indicates the level of wasting. Socio economic variables included; marital status, religion of the

caregiver, caregiver's education level and occupation of the caregiver. Demographic variables included caregiver's age, child sex, child age, child birth order, number of children under five years of age, and diarrheal occurrence.

The target population was caregivers who had children 0-5 years old in Korogocho slum, Nairobi County. The inclusion criteria for the study participants was caregivers who had at least one child who was 0-5 years old, had resided in Korogocho slums for at least six months and was willing to participate in the study. Caregivers with children who were suffering from other illnesses were excluded, because this could have affected food intake and hence the nutritional status of the child.

Sampling technique for the study

Cluster Sampling was used to select eight villages namely: Ngomongo, Ngunyumu, Highridge, Grogan, Gitathuru, Kisumu Ndogo, Nyayo and Korogocho in slums of Nairobi. Simple random sampling was done in a single step with each subject selected independently of the other members of the population. Lottery method of simple random sampling was used to pick respondents from each village, study subjects then were selected by systematic random sampling from the population by selecting every 8th subject from the list. According to APHRC [15] the estimated number of households in the larger population of Korogocho was 18,537. The estimated number of households reported with under five who had diarrhea, that is 3140 was divided by the desired sample size that is 354, to yield a sampling interval of 8. Purposeful sampling method was used to select the participants for focus group discussions. A total of 354 mothers with children less than five years were sampled for the study.

Data collection

A questionnaire with both open-ended and close-ended questions was used to interview the caregivers on two aspects; (i) The Socio-Demographic Characteristics domain contained questions related to caregivers' age, marital status, employment status, educational level and household income level, number of children less than 5 years-of age in the family, age and sex of child. (ii) The Knowledge domain which included questions regarding caregiver knowledge on nutrition management of childhood diarrhea.

Pretested focus group discussion guide was done in the three villages on groups of 8-12 women whose children were below five years of age. Participants were recruited with help of the Community Health Volunteers following administration of the informed consent.

Anthropometric measurements were performed by standard methods according to WHO Child Growth Standards for growth monitoring [16]. The weight of the children was taken in light clothing using a digital scale to the nearest 0.1kg. The length of children 0-23 months of age and length of children above 2 years were measured to the nearest 0.1cm. Mid-Upper-Arm Circumference (MUAC) was measured midway between the tip of the shoulder and the tip of the elbow to the nearest 0.1cm.

Pretesting of the questionnaires and anthropometry measurements was conducted on 10% of the study sample, and these were excluded from the study.

Table 1: Socio demographic information of caregivers.

Variable	Category	Frequency n=354
Age in Years	15-20	4 (1.1%)
	21-30	206 (58.2%)
	31-40	119 (33.6%)
	41-50	23 (6.5%)
	>50	2 (0.6%)
Level of Education	No schooling	36 (10.2%)
	Primary	203 (57.3%)
	Secondary	101 (28.5%)
	Tertiary	14 (4%)
Marital Status	Single	98 (27.7%)
	Married	171 (48.3%)
	Separated	64 (18.1%)
	Widowed	21 (5.9%)
Type of caregiver	Mother	316 (89.3%)
	Grandmother	12 (3.4%)
	Other	26 (7.3%)
Occupation	Housewife (Mother)	275 (77.7%)
	Casual	53 (15%)
	Small scale trading	26 (7.3%)

Table 2: Description of child demographic characteristics.

Variable	Category	Frequency n=354
Child Sex	Male	181 (51.1%)
	Female	173 (48.9%)
Age in Months	0-5	40 (11.3%)
	6-11	121 (34.2%)
	12-17	106 (29.9%)
	18-23	34 (9.6%)
	24-59	53 (15%)
Birth Order	1	66 (18.6%)
	2	78 (22%)
	3	94 (26.6%)
	4	75 (21.2%)
	5	41 (11.6%)
EBF <6 Months n=40	Yes	36 (90%)
	No	4 (10%)
Diarrheal Occurrence n=354	Yes	63 (17.8%)
	No	291 (82.2%)

Data management

Coding, entry and analysis was done using SPSS software version 20. Chi square was used to test the association among variables. The confidence level was set at 0.05 (95%) as recommended for most descriptive researches [17]. Descriptive statistics such as percentages and frequencies were used to describe the data while tables and charts were used to represent the results. The qualitative data, from the focus-group discussions, was categorized and analyzed using

thematic content analyses. The nutritional status data was compared with WHO Child Growth Standards [16] and presented as Z-scores with cut off point of -2 SD using indicator of weight for age, weight for age and weight for height in order to get those children who were wasted, underweight or stunted respectively. Child anthropometry was analyzed using ENA for Smart software. Z-scores were calculated for height-for-age, weight-for-height, and weight-for-age using computer-based software ENA for Smart. Mid-Upper Arm Circumference (MUAC) : <11.5cm: Severe Acute Malnutrition, 11.5-12.4cm: Moderate Acute Malnutrition, 12.5-13.5cm: risk of acute malnutrition and >13.5cm: child well nourished. Children with Z-Score below < -2SD and/or MUAC below 12.4cm were taken to be malnourished.

Ethical considerations

Ethical clearance to conduct research was granted by Kenyatta University Ethical Review Committee, a permit to carry out the study was also given by the National Council of Science, Technology and Innovations of Nairobi, Kenya. Consent for participation was sought from the Ministry of health, the selected health facilities and mothers of children 0-59 months old.

Results

Socio demographic characteristics of caregivers

A total of 354 caregivers (age 17-55 years) distributed within five out of the eight villages of Korogocho slum were interviewed. Attributes such as age, level of education and marital status are presented. Most of the caregivers were of the age 21-30 years. Majority of the caregivers (89.3%) were mothers, grandmothers were 3.4%, while other caregivers were 7.3%. Female caregivers were 346 while male caregivers were eight (Table 1).

Child demographic characteristics

Only forty children (11.3%) were below six months. Majority of the children were male (51.1%). The study included children aged 0-59 months with a mean age of 28.7 months. The age group 6-11 months had most of the children who participated in the study (34.2%). The age group 24-59 months had a fewer number of children participating in the study despite the group being the largest. Most of the children at this age group were not with their primary caregivers at home during the time of the study. The prevalence of diarrhea among fewer than five index children in the study was 17.8%. However, the prevalence was different across the age groups. The age group 6-11 months had the highest prevalence which was 21.5%, the 0-5 month's age group prevalence was 17.5%, the age group 12-17 months prevalence was 17%, the 18-23 months age group prevalence was 14.7% and 24-59 months age group recorded the lowest prevalence of diarrhea at 13.2% (Table 2).

The occurrence of diarrhea and its implication on child feeding

Among caregivers whose children had diarrhea two weeks preceding the survey, only 7.9% gave zinc supplements as recommended to their child, which is 10mg per day for children below six months and 20mg per day for children above six months for 10-14 days. Only 6.3% of caregivers gave zinc supplements and increased amount and frequency of feeding in their children during diarrhea thus had knowledge of nutritional management of diarrhea.

Table 3: Feeding practices among children introduced to solid foods.

		Amount of food given to the child per meal during diarrhea				Total	χ^2	df	p-value
		More	Same	Less	Total				
Individual food restriction in a meal during diarrhea	Yes	4	51	109	164	6.639	2	0.036	
	No	12	56	86	154				
	Total	16	107	195	318				

Table 4: Diarrhea and nutrition status of children 6-59 months.

		Nutrition status (wasting)					Total	χ^2	df	p-value
		Severe <-3SD	Moderate <-2SD	At Risk	Normal	Total				
Diarrhea	Yes	3	5	12	36	56	9.381	3	0.025	
	No	2	14	39	203	258				
	Total	5	19	51	239	314				

Caregivers were asked to produce or identify the zinc tablet/syrup to confirm availability and utilization.

None of the caregivers scored above 80% in the knowledge index score. A few of the respondents (7.3%) scored 60-80% on the knowledge index score. One hundred and four (29.4%) caregivers scored 40-59% while majority (63.3%) scored below 40% on the knowledge index score. Caregivers did not just withhold foods generally but did that for some specific foods (Table 3).

Five children out of the thirty six (16.7%), who had diarrhea two weeks preceding the study. Sixty three children out of 354 children had diarrhea. Only a few children (14.3%) were fed according to the national operational guidelines for infant and young child during diarrhea [9].

Nutrition status of the children

Overall, 29.1% of the children were stunted, 16.6% of the children were underweight, and 7.6% of the children were wasted.

Among children 6-59 months, fifty six children (17.8%) had experienced diarrhea two weeks preceding the survey. Three of the children (5.36%) had severe wasting, five children (9.29%) had moderate wasting, twelve children (21.43%) were at risk of malnutrition and thirty six children (64.29%) were well nourished (Table 4).

The level of under nutrition (wasting) was higher in children who had diarrhea two weeks preceding the surveys (14.29%) compared to those who didn't have diarrhea (6.2%). Prevalence ratio was used to determine the relationship between diarrhea and malnutrition. Prevalence ratio is used when outcome occurs over a short period of time (Table 5).

The prevalence ratio and proportion indicated that the children with diarrhea were 2.3 times as likely to be malnourished (wasted) compared to those who did not have diarrhea.

Focus group discussions revealed that caregivers gave the children *Mala*, 'Yoghurt' saying that it 'heals' the stomach during childhood diarrhea. Some caregivers recommended boiled or roasted foods such as bananas and potatoes saying they hold the stool. The caregivers reported that sorghum porridge with sugar, salt and orange fruit juice as additives treats diarrhea and gives energy to the child. Some

Table 5: Prevalence ratio of malnutrition to diarrhea among children with and without diarrhea.

	Malnourished <-2 SD	Well Nourished \leq -2 SD	Total
Children with diarrhea	8 (a)	48 (b)	56
Children without diarrhea	16 (c)	242 (d)	258
	24	290	314

would give the child sorghum porridge plus more water, whereas others would only give the porridge alone. Caregivers also said that 'sorghum meal' locally referred to as *ugali* sorghum can serve the same purpose as sorghum.

Caregivers said that wheat porridge treats diarrhea in a day. The wheat porridge preparation was as follows: caregivers boiled one cup of water (250ml); mixed two spoonfuls of wheat separately with water, added salt and sugar; and then spoon fed the child and gave the child more water. One mother in the focus group discussion who was fifty three years old said that she had used wheat porridge to manage diarrhea in all her five children.

Discussion

Overall, 29.1% of children were stunted, 7.7% were wasted, and 16.7% were underweight. This figure was close to findings from the Kenya National Bureau of Statistics [18] which indicated stunting levels for under fives at 26%, wasting level at 4% and underweight at 11%. This study showed that the prevalence of childhood diarrhea among under-five index children was 17.8% in the study area. This is in line from findings from [18] which showed 15% of children under age 5 had diarrhea and diarrhea prevalence was highest among children 6-11 and 11-23 months (27% and 24%). The prevalence of diarrhea among exclusive breast fed child was 16.7% whereas among children not exclusively breast fed was 25%.

The prevalence ratio and proportion indicated that the children with diarrhea were 2.3 times as likely to be malnourished (wasted) compared to those who did not have diarrhea.

Beliefs regarding food restrictions during childhood diarrhea were common among caregivers. The caregivers perception observed in this study is consistent with the findings of study by [19] where she found that 71.2% reported food withdrawal during episodes of

diarrheal while only 28.8% reported sustained feeding. The study results on feeding practices were in line from findings from [18] which showed that 32% of children were given same amount of food, 3% were given more to eat, 31% somewhat less to eat, 18% much less to eat while 7% were given nothing to eat.

The three focus group discussions held with the caregivers were consistent with findings from several studies which reported that caregivers restricted and withdrawn sugary and sweet foods which they perceived to be causes of diarrhea [19].

Among the sixty three children having diarrhea two weeks preceding the survey, only five (7.9%) caregivers gave their child zinc supplements correctly for the treatment of diarrhea, this is similar to [18] who reported the use of zinc to treat diarrhea at 8%, that is one in six mothers/caregivers (17%) were aware of zinc tablets. Only four (6.3%) caregivers with children having diarrhea two weeks to the study gave zinc supplements and increased amount and frequency of feeding in their children during diarrhea. The results of this study are consistent with a study by [20] who found that 11% of caregivers were unsure about how to administer zinc and 2.8% did not know about the existence of zinc treatment.

Caregivers reported the use of food remedies such as *Mala* 'Yoghurt', sorghum and wheat to manage diarrhea. The findings of this study were in line with a study by [21] where wheat flour was mentioned as effective means of alleviating diarrhea which was boiled and then upon cooling it was administered orally to children. A study by [22-36] gave similar findings where 31.3% of mothers used dough in managing diarrhea in their children.

Conclusion

The study demonstrated that caregivers were not knowledgeable with optimal feeding of children during diarrheal episodes as per the National Operational Guidelines for Health Workers [9]. It was evident that caregivers were not aware of zinc supplementation as a first line treatment for diarrhea and those who knew were not aware of the correct dosage. The poor knowledge of caregivers regarding the need for growth monitoring of a child in the management of childhood diarrhea may have contributed to the severity and duration of diarrhea. Caregivers preferred using traditional foods such as yams, cassava and roasted bananas in the management of childhood diarrhea because of the belief that they could control diarrhea.

Recommendation

Community based actors should carry out education interventions among caregivers at community level with the aim of improving feeding of children during diarrheal illness. The ministry of health should ensure proper training and availability of zinc at home or at community level. Caregivers should be sensitized on the importance of zinc supplementation as first line treatment during childhood diarrhea. Health care workers should educate the caregivers on the need of monitoring weight changes when a child has diarrhea to prevent deterioration of the child's condition. The county health services should ensure that there are information, education and communication strategies to help create positive attitude among caregivers regarding optimal feeding during childhood diarrhea.

Further studies on dietary patterns during childhood diarrhea

should be carried out to correct local perceptions and prevailing beliefs in the community, and also come up with guidelines for counseling the caregivers on nutritional management of diarrhea.

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