

Diarrhea Morbidity and Associated Factors among Preschool Children of Hawking Mothers in Nairobi City Markets, Kenya

Karani Lizbeth Kageni

MPH-Kenyatta University

Department of Health and Biomedical sciences, Program of Human Nutrition and Dietetics, Technical University of Kenya, Kenya

Abstract

Background: Diarrhea remains an important cause of morbidity among young children, particularly in settings where access to safe water, sanitation and hygiene is limited. Children accompanying mothers who engage in hawking may be particularly vulnerable because they spend prolonged periods in market environments where water, sanitation, food hygiene and childcare may be constrained.

Materials and Methods: A descriptive cross-sectional survey was conducted among 350 children aged 6–59 months accompanying mothers/caregivers engaged in hawking activities in Muthurwa and Toi markets in Nairobi. Multistage sampling was followed by systematic random sampling. Data were collected using structured interviewer-administered questionnaires, an observation checklist and anthropometric measurements. Diarrhea morbidity was assessed from caregiver reports of diarrhea during the two weeks preceding the survey. Descriptive statistics and chi-square tests were used to assess associations between diarrhea morbidity and categorical variables; $p < 0.05$ was considered statistically significant.

Results: Of the 350 children, 187 (53.4%) had experienced diarrhea during the two weeks preceding the survey and 163 (46.6%) had not. Among children with reported diarrhea, 50.3% had loose stools, 26.2% watery stools and 23.5% bloody stools. Significant associations were observed between diarrhea morbidity and number of children under five years in the household ($\chi^2 = 6.750$, $df = 2$, $p = 0.034$), maternal/caregiver education ($\chi^2 = 7.935$, $df = 3$, $p = 0.047$), source of drinking water ($\chi^2 = 32.141$, $df = 2$, $p < 0.001$), water storage method ($\chi^2 = 10.321$, $df = 3$, $p = 0.016$), toilet cleanliness ($\chi^2 = 17.030$, $df = 1$, $p < 0.001$), and age at initiation of complementary feeding ($\chi^2 = 10.980$, $df = 4$, $p = 0.027$). Market observations documented unclean toilets, open drains, uncovered food and inadequate hand hygiene.

Conclusion: Diarrhea morbidity was high among preschool children accompanying hawking mothers in the two Nairobi markets. The findings point to the importance of interventions addressing safe water, sanitation and hygiene, food safety, appropriate complementary feeding and caregiver education within market environments.

Key Word: Diarrhea; preschool children; hawking mothers; Nairobi; water; sanitation; hygiene; complementary feeding.

Date of Submission: 09-08-2026

Date of Acceptance: 21-08-2026

I. Introduction

Diarrhea remains a major public health problem among children under five years, particularly in settings characterized by inadequate water, sanitation and hygiene. The original thesis identified diarrhea morbidity and malnutrition as important public health concerns among preschool children in vulnerable urban settings. Children under five years are particularly susceptible because of their rapid growth and development and immature immune systems. [1,2]

Original thesis reported that in Kenya children living in unsanitary environments experienced higher levels of diarrhea and were more likely to experience poor growth than children living in healthier environments. Access to safe water, sanitation, hygiene and appropriate food handling are therefore central to prevention of childhood diarrhea. [3,4]

Children of hawking mothers constitute a population that may face additional risks. Hawking mothers may spend much of the day in markets accompanied by their young children. The nature of the work may compromise child feeding and care practices, while market environments may provide limited access to safe water, sanitation and facilities for hygienic food preparation and handwashing. The original study noted that relatively little research had focused specifically on diarrhea morbidity among preschool children of hawking mothers. [5]

The present paper focuses on the diarrhea component of the original research and aims to describe the prevalence of diarrhea and the factors statistically associated with diarrhea morbidity among children aged 6–59 months accompanying hawking mothers in two Nairobi City markets.

II. Material And Methods

Study Design: Descriptive cross-sectional survey.

Study Location: Muthurwa and Toi markets, Nairobi County, Kenya. Muthurwa is located near Nairobi's central business district, while Toi market is located near Kibera. Both are busy informal trading environments.

Study Population: Preschool children aged 6–59 months accompanying their mothers/caregivers who were engaged in hawking activities in the selected markets.

Study Duration: The study period was from January 2010 to April 2011.

Sample size: 350 mother/caregiver–child pairs; 175 respondents were selected from each market.

Sampling method: Nairobi was purposively selected, followed by selection of study divisions and markets. Systematic random sampling was then used to select respondents within the markets.

Data collection: Structured interviewer-administered questionnaires were used to collect socio-demographic information, child feeding practices, water and sanitation information and diarrhea morbidity. An observation checklist assessed market sanitation and hygiene conditions. Four trained field assistants supported data collection, and age recall was supported using a prominent event calendar when necessary.

Definition of diarrhea: For this study, diarrhea morbidity referred to the number of children aged 6–59 months reported to have diarrhea. Prevalence referred to the percentage of children reported to have diarrhea during the two weeks preceding the survey.

Statistical analysis: Data were coded and entered into Microsoft Excel, verified and exported to SPSS for analysis. Descriptive statistics were presented as frequencies and percentages. Chi-square tests were used to examine associations between categorical variables. Statistical significance was set at $p < 0.05$ with a 95% confidence level.

Ethical considerations: Research protocol was undertaken through Kenyatta University graduate school and National Council for Science and Technology (NACOSTI). The relevant district offices were informed. Participants were informed of the study, participation was voluntary, confidentiality and anonymity were assured, and informed consent was obtained.

III. Result

A total of 350 mother/caregiver–child pairs participated in the survey, with 175 respondents from each of the two markets. The study population comprised children aged 6–59 months accompanying hawking mothers/caregivers. [6]

Table 1: Socio-demographic characteristics of mothers/caregivers

Variable	Category	Frequency	Percent (%)
Age (years)	≤30	236	67.4
	31–36	109	31.1
	>36	5	1.5
Education	No schooling	112	32.0
	Primary	121	34.6
	Secondary	82	23.4
	College and above	35	10.0
Marital status	Single	88	25.1
	Married	110	31.4
	Separated	77	22.0
	Divorced	40	11.4
	Widowed	35	10.0

Most mothers/caregivers were aged 30 years or below (67.4%). Thirty-two percent had no schooling, while 34.6% had primary education, 23.4% secondary education and 10.0% college education or above. Married mothers/caregivers represented 31.4% of respondents. [6]

Table 2: Household characteristics and food availability

Variable	Category /no of members	Frequency	Proportion (%)
Household size	2	1	0.3
	3	18	5.1
	4	76	21.7
	5	137	39.1
	6	71	20.3
	7	28	8.0
	8	15	4.3
	9	4	1.1

Variable	Category /no of members	Frequency	Proportion (%)
Children <5 years	1	93	26.6
	2	197	56.3
	3	60	17.1
Main household income	Casual labour	170	48.6
	Petty trading	162	46.3
	Salaried employment	18	5.1
Skipping meals	Yes	191	56.6
	No	159	45.4

Most households had five members (39.1%). More than half of households (56.3%) had two children below five years. Casual labour was the main household source of income for 48.6%, followed by petty trading at 46.3%. The thesis reported that 56.6% of households skipped meals at times; among these households, 39.8% skipped meals for three to seven days and 28.3% for more than one week. [6,7]

3.1 Diarrhea morbidity

Of the 350 children studied, 187 (53.4%) were reported to have experienced diarrhea during the two weeks preceding the survey, while 163 (46.6%) had not.

Table 3: Distribution of stool texture among children with diarrhea

Age (months)	Watery stool n (%)	Loose stool n (%)	Bloody stool n (%)
6–11	8 (4.3)	12 (6.4)	3 (1.6)
12–23	17 (9.1)	28 (15.0)	18 (9.6)
24–35	8 (4.3)	21 (11.2)	11 (5.9)
36–47	8 (4.3)	17 (9.1)	9 (4.8)
48–59	8 (4.3)	16 (8.6)	3 (1.6)
Total	49 (26.2)	94 (50.3)	44 (23.5)

Among the 187 children with reported diarrhea, 50.3% had loose stools, 26.2% watery stools and 23.5% bloody stools. Children aged 12–23 months accounted for the largest proportion of cases, including 15.0% of all reported loose-stool cases and 9.6% of bloody-stool cases. [8]

3.2 Caregiver perceptions and treatment seeking

Among caregivers of children who had diarrhea, 38.0% believed contaminated food or milk was the cause, 28.3% attributed diarrhea to dirty water, 15.0% to bewitchment and the remainder to teething. [8]

Overall, 47.4% of mothers/caregivers reported seeking medication when their children became sick, while 52.6% did not. Among those who sought care, 34.9% visited clinics/pharmacies, 31.3% traditional healers, 18.0% public health facilities and 15.7% relied on self-treatment. The thesis reported that approximately 53% of children with diarrhea in the preceding two weeks received treatment from a public health facility or private clinic/pharmacy. [9]

3.3 Factors associated with diarrhea morbidity

Six categorical variables were statistically significantly associated with diarrhea morbidity at $p < 0.05$: number of children under five years in the household, maternal/caregiver education, source of drinking water, method of drinking-water storage, toilet cleanliness and age at initiation of complementary feeding.

Table 4: Association between diarrhea morbidity and categorical variables

Independent variable	Category	Diarrhea n (%)	No diarrhea n (%)	χ^2	df	p
Children <5 years	1 child	39 (11.1)	54 (15.4)	6.750	2	0.034*
	2 children	114 (32.6)	83 (23.7)			
	3 children	34 (9.7)	26 (7.4)			
Mother's /caregivers level of Education	No schooling	67 (19.1)	45 (12.9)	7.935	3	0.047*
	Primary	61 (17.4)	60 (17.1)			
	Secondary	47 (13.4)	35 (10.0)			
	College+	12 (3.4)	23 (6.6)			
Source of drinking water	Tap	32 (9.1)	65 (18.6)	32.141	2	<0.001*
	Well	118 (33.7)	56 (16.0)			
	Vendor	37 (10.6)	42 (12.0)			
Water storage	Jerry can	36 (10.3)	41 (11.7)	10.321	3	0.016*
	Bucket	99 (28.3)	59 (16.9)			

Independent variable	Category	Diarrhea n (%)	No diarrhea n (%)	χ^2	df	p
Toilet clean	Basin	36 (10.3)	40 (11.4)	17.030	1	<0.001*
	Drum	16 (4.6)	23 (6.6)			
	Yes	109 (31.1)	59 (16.9)			
	No	78 (22.3)	104 (29.7)			
Age of Complementary feeding	2 months	36 (10.3)	30 (8.6)	10.980	4	0.027*
	3 months	47 (13.4)	61 (17.4)			
	4 months	38 (10.9)	20 (5.7)			
	5 months	36 (10.3)	20 (5.7)			
	6 months	30 (8.6)	32 (9.1)			

*Significant at $p < 0.05$. Counts and percentages are reproduced from the association table in the original thesis.

3.4 Market environmental observations

The observation checklist documented several environmental and hygiene concerns. Fifty-two percent of visits revealed unclean toilets, 48.3% showed open drains, 52.3% showed littered waste, and 64% of observed locations had no garbage collection points. Food was not covered in 53.1% of observations, 53.1% of persons did not wash their hands before feeding children, 56.6% of children did not wear footwear all the time and 52.9% of water supply points were not protected. [10]

IV. Discussion

The study found a high two-week diarrhea morbidity of 53.4% among children aged 6–59 months accompanying hawking mothers in Muthurwa and Toi markets. The population studied is distinct from the general urban child population because the children spent substantial time with caregivers in crowded market environments. The thesis concluded that poor food and water hygiene, sanitation and overcrowding were important public health concerns in the study setting. [11]

Source of drinking water was strongly associated with diarrhea morbidity ($\chi^2=32.141$, $p < 0.001$). Nearly half of the households obtained drinking water from wells, while 27.7% used taps and 22.6% used vendor-provided water. The observed association is consistent with the conceptual framework used in the thesis, in which safe water and sanitation form important determinants of child health. [12]

Water storage was also significantly associated with diarrhea morbidity ($\chi^2=10.321$, $p=0.016$). The original study reported that 45.2% of caregivers stored drinking water in buckets, 22.0% in jerry cans, 21.7% in basins and 11.0% in drums. Storage can provide opportunities for contamination after collection, especially where water is accessed repeatedly during the day.

Toilet cleanliness was significantly associated with diarrhea morbidity ($\chi^2=17.030$, $p < 0.001$). The observation checklist showed that 52% of market visits revealed unclean toilets, while open drains and inadequate waste management were also common. The market environment therefore provides an important context for understanding the observed diarrhea burden. [10]

Maternal/caregiver education was significantly associated with diarrhea morbidity ($\chi^2=7.935$, $p=0.047$). The thesis reported lower diarrhea morbidity with increasing education level. Education may influence knowledge and practices concerning water handling, food preparation, hygiene and care-seeking; however, because this was a cross-sectional analysis based on bivariate associations, the finding should not be interpreted as evidence of an independent causal effect.

The number of children under five years in the household was also significantly associated with diarrhea morbidity ($\chi^2=6.750$, $p=0.034$). The majority of households had two children below five years. A greater number of young children may increase caregiving demands and opportunities for transmission of infectious agents within households, although the present study did not investigate these pathways directly.

Age at initiation of complementary feeding was significantly associated with diarrhea morbidity ($\chi^2=10.980$, $p=0.027$). The original study reported that 82.3% of caregivers introduced complementary foods before six months, with only 17.7% initiating complementary feeding at six months. Early introduction may increase exposure to foods and water prepared under conditions of limited hygiene, particularly within the market environment. [13]

Caregiver perceptions are also important. Although contaminated food or milk and dirty water were commonly identified as causes of diarrhea, some caregivers attributed diarrhea to bewitchment or teething. These beliefs may influence health-seeking behavior. More than half of caregivers reported not seeking medication when their children became sick, and traditional healers were among the sources of care used by those who sought assistance. [9]

The environmental observations reinforce the need for market-specific interventions. Uncovered food, inadequate handwashing, unclean toilets, open drains and poor waste management provide multiple opportunities

for exposure to enteric pathogens. The original thesis cited evidence that handwashing with soap and improved water and sanitation are important measures for reducing diarrhea. [14,15]

V. Limitations

The study was cross-sectional and therefore cannot establish temporal or causal relationships between the observed factors and diarrhea morbidity. Diarrhea was based on caregiver report, creating potential for recall and classification bias. The thesis also identified self-reporting as a study limitation. In addition, the study was conducted in only two Nairobi markets, limiting generalizability to other markets and populations. Finally, only bivariate chi-square analyses were reported; therefore, potential confounding was not controlled through multivariable analysis.

VI. Conclusion

Diarrhea morbidity was high among preschool children accompanying hawking mothers in Muthurwa and Toi markets in Nairobi. More than half of the children had experienced diarrhea during the two weeks preceding the survey. Significant associations were observed with household number of children under five years, maternal/caregiver education, drinking-water source, water storage method, toilet cleanliness and age at initiation of complementary feeding.

The findings support an integrated approach to diarrhea prevention that addresses safe water, sanitation, hand hygiene, food safety, appropriate complementary feeding and caregiver education. Because the children accompany mothers in market settings, interventions should also improve the environmental conditions of markets and provide affordable, accessible sanitation and handwashing facilities.

VII. Recommendations

- Improve access to safe and reliable drinking water within markets.
- Provide adequate, affordable and regularly cleaned toilets with water and facilities for handwashing.
- Strengthen hygiene education for hawking mothers/caregivers, particularly handwashing before feeding children and safe food handling.
- Promote appropriate complementary feeding and safe preparation and storage of complementary foods.
- Develop child-friendly market interventions that recognize the needs of children accompanying working mothers.
- Strengthen caregiver education on recognition of diarrhea, danger signs and timely treatment-seeking.
- Conduct further studies using multivariable analyses to identify independent predictors of diarrhea morbidity in this population.

References

- [1] Black RE, Brown KH. Effects of diarrhoea-associated specific enteropathogens on the growth of children in rural Bangladesh. *Pediatrics*. 2003.
- [2] UNICEF. State of the World's Children. New York: UNICEF; 2006–2009 editions cited in the original thesis.
- [3] UN-HABITAT. Urbanization, poverty and health/environmental conditions in Nairobi and other urban settings. 2008.
- [4] Curtis V, Caincross S. Effect of washing hands with soap on diarrhea risk in the community: a systematic review. *Lancet Infect Dis*. 2003;3:275–281.
- [5] Gyimah S. Interaction effects of maternal education and household facilities on childhood diarrhea in sub-Saharan Africa. *Journal of Health and Population in Developing Countries*. 2003.
- [6] Karani Lizbeth Kageni. Diarrhoea Morbidity and Nutritional Status among Pre-school Children of Hawking Mothers in Nairobi City Markets, Nairobi County, Kenya. MPH-Nutrition thesis. Kenyatta University.
- [7] Kenya Demographic and Health Survey (KDHS). Kenya Demographic and Health Survey Report. Nairobi, Kenya; 2008.
- [8] WHO/UNICEF. Malnutrition and childhood diarrhea-related guidance cited in the original thesis. Geneva/New York; 2009.
- [9] Arungo BP. Maternal knowledge, attitudes and practices in the management of childhood diarrhoea: a case of Tambach Division, Keiyo District, Kenya. MSc Thesis, Kenyatta University; 2006.
- [10] Karani Lizbeth Kageni. Market observation checklist findings from the original study. Nairobi City Markets; study report.
- [11] FSAU. Nutrition: A Guide to Data Collection, Analysis, Interpretation and Use. USAID/OFDA; 2003.
- [12] Trevett AF, Carter RC. Targeting appropriate interventions to minimize deterioration of drinking water quality in developing countries. *J Health Popul Nutr*. 2008;26(2):125–138.
- [13] Pan American Health Organization/WHO. Guiding Principles for Complementary Feeding of the Breastfed Child. Washington/Geneva: PAHO/WHO; 2003.
- [14] Cairncross S, Valdmanis V. Water supply, sanitation and hygiene promotion in disease control priority projects. In: *Disease Control Priorities in Developing Countries*. 2nd ed. 2007.
- [15] Takanashi K. Survey of food-hygiene practices at home and childhood diarrhea in Hanoi, Viet Nam. 2009.