

ORIGINAL ARTICLE

Prevention and home-based management of childhood diarrhoea in an urban informal settlement in Northern Ghana; a cross-sectional study of maternal knowledge, attitude and practices

Ezekiel K. Vicar¹  | Williams Walana¹  | Mildred G. O. Marfo² | George K. Darko³  | Majeed S. Folorunsho⁴  | Emmanuel K. Osabutey⁵  | Mauvina Obeng-Bempom⁶  | Kwame Opare-Asamoah⁴ 

¹Department of Clinical Microbiology, University for Development Studies, Tamale, Northern Region, Ghana

²Department of Community and Preventive Medicine, University for Development Studies, Tamale, Northern Region, Ghana

³Department of Medical Laboratory, Tolon District Hospital, Ghana Health Service, Tolon, Northern Region, Ghana

⁴Department of Biological Sciences, University for Development Studies, Tamale, Northern Region, Ghana

⁵Department of Human Anatomy, University for Development Studies, Tamale, Northern Region, Ghana

⁶Department of Pediatrics and Child Health, Tamale Teaching Hospital, Tamale Northern Region, Ghana

Correspondence

Ezekiel K. Vicar, Department of Clinical Microbiology, University for Development Studies, Tamale, Northern Region, Ghana.
Email: ekvicar@uds.edu.gh

Funding information

None

Abstract

Background: The burden of diarrhoea morbidity and mortality among children under 5 years is higher in developing countries than in developed regions. Residents of informal settlements in many developing lower-and-middle-income countries (LMICs) have a relatively high prevalence of diarrhoea and diarrhoea-related diseases. Mothers are the burden bearers during children's diarrhoea episodes. Therefore, maternal knowledge and management skills are important to minimise the effects of morbidity and mortality associated with diarrhoeal diseases.

Methods: This cross-sectional study was conducted among mothers residing in an informal settlement to assess their knowledge of diarrhoea prevention and home-based management practices. An interviewer-based questionnaire was used to gather information, imported into Microsoft Excel (Microsoft) and exported to STATA software version 13.1 (Stata) for data analysis. We performed descriptive multivariable analysis to find out participants knowledge of diarrhoea prevention and home-based management practices and associated factors.

Results: A total of 428 participants participated in this study, with the majority, 64.5% (276/428) having good knowledge of prevention and home-based management of diarrhoea among children under 5 years. Multivariable logistic regression analysis, participants who were multiparous and completed tertiary were 4.01 [confidence interval (CI) = 3.23–7.15; $p < 0.0001$] and 2.02 (CI = 2.16–4.91; $p = 0.005$) times likely to have good knowledge. Participants who had attained tertiary education and earned monthly income above Gh¢ 4000 were 7.21 (CI = 5.24–16.5; $p < 0.0001$) and 12.4 (CI = 4.80–33.3; $p < 0.0001$) likely to have good practice of prevention and home-based management of diarrhoea among children under 5 years.

Conclusion: These findings may serve as a basis for developing specific interventions to enhance good knowledge and good practice regarding home-based management of diarrhoea among children under five. Practitioners can provide targeted education, empower mothers to implement proper preventive measures and timely interventions thereby reducing the impact and severity of diarrhoeal episodes in children under 5 years in urban informal settlements.

KEYWORDS

diarrhoea, home-based management, prevention, under-five children, urban informal settlements

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2024 The Author(s). *Reproductive, Female and Child Health* published by John Wiley & Sons Ltd.

INTRODUCTION

Diarrhoea is a leading cause of morbidity and mortality among children under 5 years worldwide.¹ The World Health Organization (WHO) estimated about 149 million cases of diarrhoea in children under five in 2019, contributing to approximately 1.4 million deaths.¹ Diarrhoea mortality burden among these children is higher in developing countries than in developed regions.^{2–5} Many developing African lower-and-middle-income countries (LMICs) have urban informal settlements.⁶ These informal settlements characterised by high population density, poor sanitation, lack of consistent access to clean water and proximity to household animals which promote the spread of infectious pathogen with diarrhoea as an outcome.^{6,7} It is common to see children play in soil and near open drains, putting them at significantly higher risk of colonisation and infection with faecal pathogens from animals and humans resulting in diarrhoea than among children in formal residents.^{3,8–10} Additionally, poor maternal knowledge of diarrhoea, poor practices like avoidance of breastfeeding,^{11–14} inadequate nourishment,¹² poor hand hygiene practice,¹⁵ poor disposal of sanitary waste,^{12,15,16} use of traditional and unprescribed medication^{15,17} have been reported to increase the likelihood of diarrhoeal infections.¹⁶

Diarrhoea has enormous impact on the growth and development of the child with spiralling effect into adolescence.^{5,18} Apart from the loss of appetite, change in feeding practise and reduction in absorption of nutrients,^{13,15,19} children affected by diarrhoea for a day lose between 20 and 40 g in body weight and those who experience diarrhoea during the first 2 months of birth are approximately 1.5 cm shorter than those who never experience diarrhoea.¹³ The WHO has recommended proper home management of diarrhoea that can reduce the markedly negative impact in children.¹³ The use of oral rehydration therapy and continuous breast feeding for children under 2 years and those who are already being breastfed can significantly reduce diarrhoea-related mortality.^{16,18–20} However, the knowledge and practice of home-based management of diarrhoea in children under five in urban informal settlements of LMICs are inadequate.^{11,18}

Mothers, who generally bear the burden of the health needs of their households, especially in children under five need adequate knowledge and management skills to mitigate the effects of morbidity and mortality associated with diarrhoeal diseases in children.^{12,13} This study therefore aimed at assessing maternal knowledge and home-based management of diarrhoea cases, in such urban informal settlements in Northern Ghana.

METHOD

Study area

This community-based cross-sectional survey was conducted in the Tamale metropolis of Ghana between

February and May 2023. The metropolis lies between latitude 9° 16 and 9° 34 north and longitude 0° 36 and 0° 57 west.^{21,22} The metropolis has one of the fastest-growing populations with a current population of 374 744, of which 185 051 are males and 189 693 are females.²² There are about 35 408 households in the metropolis with an average of 11 members per household.²² Moshe Zongo is one of the informal settlements in the metropolis and was purposely selected because it is the largest community within the metropolis with characteristic of an urban informal settlement per the metropolitan's demography. The community is dotted with many drugs or chemical shops and other informal sales of medicines.²³

Selection of household and participants and sample size estimation

A multistage sampling technique was used to select the households and participants as described elsewhere.²³ First, the study area was divided into four suburbs. In each suburb, major streets were used to divide the suburb into quadrants, and an approximately equal number of houses were sampled from each quadrant. Second, a household was randomly selected from each housing unit. In each selected household a mother with at least a child aged less than 5 years old who had diarrhoea within 6 months before the study was recruited for the study.

The minimum sample size for the study was calculated using the Cochran formula.²⁴ The confidence interval (CI) was 95%, the Z statistic was 1.96 and the P was 0.05.

$$n = \frac{Z^2 P(1 - P)}{d^2} = \frac{1.96^2 \cdot 0.5(1 - 0.5)}{(0.05)^2} = 384. \quad (1)$$

A 10% attrition was added giving the minimum sample size of 423.

Data collection procedure and study instrument

We searched through available literature and adopted our questionnaire to assess mothers' knowledge of the prevention and home-based management of diarrhoea.^{12,15,19} The questionnaire had sections on participants' sociodemographic characteristics, knowledge, attitude and practice sessions on diarrhoea in children. Trained research assistants administered the questionnaire, and when appropriate, a translated version in Dagbanli, the most predominant native language was used. The translation was done by the Ghana Institute of Linguistics, Literacy and Bible Translation (GILLBT). The questionnaire was pretested, and adjustment made where necessary.

The responses to the knowledge questions were either 'True' or 'False' or 'Yes' or 'No' and scored 1 for a correct response. The knowledge score (*K*-score) was estimated as the number of correct answers out of the 22 questions. For the purpose of analysis, the mean knowledge score was used to categorise the participants into two groups. Those with those with knowledge score above the mean score were categorised as having good knowledge and those with knowledge score below were categorised as having poor knowledge as described by Bulabula et al.²⁵

Each desired answer was scored 1 for the attitude scores, and the mean score was calculated for each respondent. Those with an attitude score equal to or above the mean score were classified as having a good attitude, and those below the mean score were recorded as poor. For preventive practices, each desired response was also scored 1.

Cronbach's α inter-relatedness score for the test items in the knowledge, attitude and prevention and home-based management of diarrhoea sections were 0.82, 0.55 and 0.65 respectively.

Data analysis

The data was entered into Microsoft Excel (Microsoft) and exported to STATA software version 13.1 (Stata) for data analysis. Descriptive analysis included frequencies, mean and standard deviation (SD). Also, frequencies of correct answers in the knowledge section and expected answers for the attitude and practice sections were reported.

Inferential analysis was done to determine the relationship between participants baseline characteristics and knowledge, attitudes and home-based management of diarrhoea with using the chi-square test. The proportions of desired attitude and practice between the *K*-scores were compared. Furthermore, a logistic regression analysis was used to identify predictors of antibiotic self-medication as a home-based management of diarrhoea practice and to assess the correlation between knowledge and sociodemographic characteristics. For all statistical analysis, a $p < 0.05$ was considered statistically significant. Adjusted odds ratio (aOR) with a CI of 95% was used for logistic regression analysis.

Ethical considerations

Ethical approval for the study was granted by the Institutional Review Board of the University for Development Studies, Tamale, Ghana. Permission to conduct the study in the study was sought and obtained from the Tamale Metropolitan Health Directorate. Written or thumb-printed informed consent was obtained from all participants after explaining the study objectives, risks, benefits, right to refuse and

confidentiality. Participation was purely based on volunteerism. The identity and data of participants were kept confidential.

RESULTS

Baseline characteristics of participants

The study participants had a mean knowledge score of 12.2 (SD 1.7) In all a total of 428 participants were involved in the study. The mean ($\pm$ SD) age of participants was 26.5 (2.1) years with the majority 64.5% (276) within 25–34 years. The majority 37.6% (161) had attained a secondary level of education, 21.5% (92) had no formal education, 28.5% (122) primary and 12.4% (53) tertiary education. In terms of employment status, 36.4% (156) of the respondents were self-employed, 34.6% (148) employed and 29.0% (124) were unemployed. and. Most of the participants 34.8% (149) receive a monthly income <1000 Ghana cedis (Gh¢) and 62.6% (268) had a family size >5. Also, multiparous women constituted 206 (48.1%) of the participants, with 46.7% (200) being multigravidas (Table 1).

Knowledge of mothers regarding prevention and home-based management of diarrhoea among children under five

The participants had an overall mean correct score of in all, 64.5% (276/428) of the participants had good knowledge of prevention and home-based management of diarrhoea in children under 5 years. Most participants 90.7% (388) chose passing loose stool three or more times in a day as the definition of diarrhoea, while 356 (83.2%) knew diarrhoea as a serious childhood health problem. On the causes of diarrhoea, 91.6% (392) of the participants identified poor hygiene, 85.0% (364) contaminated food, 85.0% (364) contaminated water and intestinal parasite 18.7% (80) as the cause of diarrhoea in children aged <5 years. With regard to the danger signs associated with diarrhoea in children aged less than 5, 86.0% (368) of the participants identified becoming weak or lethargic, 52.3% (224) dehydration, 51.4% (220) continuous vomiting, 39.3% (168) fever and 14.0% (60) marked thirst as the danger signs. Majority 84.1% (360), of the participants responded that immunisation, 79.4% (340) proper handwashing practice and 57.9% (248) proper breastfeeding can help prevent diarrhoea in children <5 years.

On hand hygiene practice towards the prevention of diarrhoea in children aged >5 years, 94.4% (404) of the participants knew they should wash their hands with soap before preparing the child's meal with 76.6% (328) comprehend they should wash their hands with soap before feeding their child. Also, 352 (82.2%) and 364 (85.0%)

TABLE 1 Sociodemographic characteristics of participants.

Characteristic	Category	n	(%)
Age	Mean $\pm$ SD	26.5 $\pm$ 2.1	
	15–24	108	(25.2)
	25–34	276	(64.5)
	35–44	44	(10.3)
Educational level	No formal education	92	(21.5)
	Primary	122	(28.5)
	Secondary	161	(37.6)
	Tertiary	53	(12.4)
Employment status	Unemployed	124	(29.0)
	Salaried worker	148	(34.6)
	Self-employed	156	(36.4)
Monthly income (Gh¢)	Below 1000	149	(34.8)
	between 1000 and 1999	131	(30.6)
	between 2000 and 3999	108	(25.2)
	4000 and above	40	(9.3)
Family size	≤ 5	268	(62.6)
	> 5	160	(37.4)
Gravidity (No. of previous pregnancies)	Once	58	(13.6)
	Multigravida	200	(46.7)
	Grand multigravida	170	(39.7)
Parity	Primiparous	98	(22.9)
	Multiparous	206	(48.1)
	Grand multiparous	124	(29.0)
Have you lost a pregnancy before?	No	344	(80.4)
	Yes	84	(19.6)
Mode of delivery	C/S	50	(14.5)
	SVD	294	(85.5)

mothers opined they should wash their hands with soap after defecation and after cleaning the child's stool or body fluid respectively (Table 2).

Attitudes of mothers to prevention and home-based management of diarrhoea among children under five

Majority 67.3% (288/423) of the participants agreed that diarrhoea is preventable and manageable at home. Similarly, oral rehydration fluids as a better alternative

TABLE 2 Overall knowledge of mothers regarding prevention and home-based management diarrhoea among children under five.

No.	Question (correct/desired response)	n	(%)
1	What do you understand by acute diarrhoea?		
	Frequent passing of watery stool (more than 3 times)	388	(90.7)
2	Diarrhoea is a serious child illness (True)	356	(83.2)
	The following are the causes of diarrhoea...		
3	Poor hygiene (Yes)	392	(91.6)
4	Contaminated food (Yes)	364	(85.0)
5	Teething (No)	248	(57.9)
6	Contaminated water (Yes)	332	(77.6)
7	Intestinal parasite (Yes)	80	(18.7)
	The following are the danger signs associated with diarrhoea...		
9	Becoming weak or lethargic (Yes)	368	(86.0)
10	Continuous vomiting (Yes)	220	(51.4)
11	Fever (Yes)	168	(39.3)
12	Dehydration (Yes)	224	(52.3)
13	Marked thirst (Yes)	60	(14.0)
14	Diarrhoea can affect the growth of your child (True)	160	(37.4)
15	Proper breastfeeding can help prevent diarrhoea (True)	180	(42.1)
16	Immunisation can help prevent diarrhoea (True)	360	(84.1)
17	Proper hand washing practice can help prevent diarrhoea (True)	340	(79.4)
18	Safe disposal of child's stool can help prevent diarrhoea (True)	156	(36.4)
	To prevent diarrhoea among children...		
19	Mothers should wash their hands with soap before preparing the child's meal (Yes)	404	(94.4)
20	Mothers should wash their hands with soap before feeding the child (Yes)	328	(76.6)
21	Mothers should wash their hands with soap after defaecation (Yes)	352	(82.2)
22	Mothers should wash their hands with soap after cleaning the child's stool or body fluid (Yes)	364	(85.0)

to traditional medicine to manage diarrhoea was ascertained by 69.2% (296) of the participants and 76.2% (326) agreed that oral rehydration fluids are the first line of treatment for diarrhoea in children. Also, 65.4% (280) of the participants agreed that exclusive breastfeeding prevents diarrhoea, and about half 51.4% (220) of the participants opining that hand hygiene practice can prevent diarrhoea (Figure 1).

Practices regarding prevention and home-based management of diarrhoea among children under five

Almost 38% (160/428) of the participants practice good home-based management of diarrhoea in children under 5 years (Table 5). Majority 61.7% (264) gave more breast milk when their child had diarrhoea. Similarly, 65.4% (280) gave more fluids with 60.7% (260) giving their child an extra meal each day to help regain weight loss after the diarrhoea had stopped (Table 3).

Participants knowledge regarding prevention and home-based management of diarrhoea among children under five and associated factors

As shown in Table 4, Educational level, Employment status, family size and Parity were associated with participants' knowledge regarding prevention and home-based management of diarrhoea among children under five.

The multivariable logistic regression showed that participants who were multiparous and grand multiparous were 4.01 (CI = 3.23–7.15; $p < 0.0001$) and 10.12 (CI = 6.11–23.00; $p < 0.0001$) times likely to have good knowledge. Participant's educational level was associated with an increase in the odds of having good knowledge of the prevention and home-based management of diarrhoea among children under five. Thus, mothers who had primary, secondary and tertiary were 2.26 (CI = 3.88–8.10; $p < 0.0001$), 4.06 (CI = 3.01–7.17; $p < 0.0001$) and 6.54 (CI = 1.68–10.40; $p < 0.0001$) times likely to have good knowledge of the prevention and home-based management of diarrhoea among children under five than those with no formal education. Furthermore, participants with a family size > 5 were 2.02 (CI = 2.16–4.91; $p = 0.005$) likely to have

good knowledge of the prevention and home-based management of diarrhoea among children under five. Self-employed and employed participants were 2.21 (CI = 1.01–2.66; $p < 0.0001$) and 3.36 (CI = 1.46–5.56; $p < 0.0001$) times likely

TABLE 3 Mothers practice home-based management of diarrhoea.

Variable	Category	n	(%)
When your child had diarrhoea, how often did you breast-feed him or her?	I gave more breast milk	264	(61.7)
	I maintained the number of breast-feeding times.	44	(10.3)
	I reduced the number of breast-feeding times.	120	(28.0)
When your child had diarrhoea, how often did you give him or her fluids?	I gave more fluids	280	(65.4)
	I maintained the amount of fluids	76	(17.8)
	I reduced the fluid intake	72	(16.8)
After the diarrhoea has stopped, did you give the child an extra meal each day to help regain weight loss.	Yes	260	(60.7)
	No	116	(27.1)
	May be	52	(12.1)
During episodes of diarrhoea which of the following made you to take your child to a healthcare facility when the child did not get better in 3 days?	Blood in the stool	28	(6.5)
	Eating or drinking poorly	20	(4.7)
	Fever	144	(33.6)
	Many episodes watery stool	28	(6.5)
	Repeated vomiting	208	(48.6)

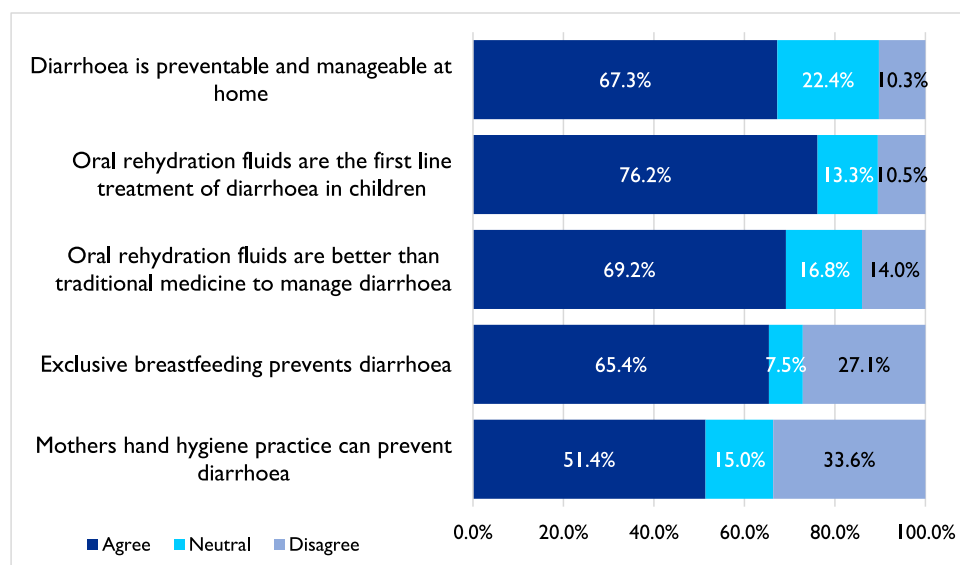


FIGURE 1 Percentage response from all respondents to statements designed to determine mothers' attitude toward prevention and home-based management diarrhoea among children under five.

TABLE 4 Factors associated with mothers' knowledge regarding prevention and home-based management of diarrhoea among children under five.

Variable	Category	N	(%)	Good		Poor		χ^2 , df	p Value
				n	(%)	n	(%)		
Age	15–24	108	(25.2)	64	(59.3)	44	(40.7)	2.66, 2	0.2648
	25–34	276	(64.5)	180	(65.2)	96	(34.8)		
	35–44	44	(10.3)	32	(72.7)	12	(27.3)		
Educational level	None	92	(21.5)	36	(39.1)	56	(60.9)	34.6, 3	<0.01
	Primary	122	(28.5)	86	(70.5)	36	(29.5)		
	Secondary	161	(37.6)	112	(69.6)	49	(30.4)		
	Tertiary	53	(12.4)	42	(79.2)	11	(20.8)		
Employment status	Unemployed	124	(29.0)	68	(54.8)	56	(45.2)	36.8, 2	<0.01
	Employed	148	(34.6)	124	(83.8)	24	(16.2)		
	Self-employed	156	(36.4)	84	(53.8)	72	(46.2)		
Monthly income(Gh¢)	Below 1000	149	(34.8)	97	(65.1)	52	(34.9)	1.83, 3	0.61
	between 1000 and 1999	131	(30.6)	85	(64.9)	46	(35.1)		
	between 2000 and 3999	108	(25.2)	72	(66.7)	36	(33.3)		
	4000 and above	40	(9.3)	22	(55.0)	18	(45.0)		
Family size	≤5	268	(62.6)	160	(59.7)	108	(40.3)		0.01
	>5	160	(37.4)	116	(72.5)	44	(27.5)		
Gravidity (number of pregnancy)	Once	58	(13.6)	36	(62.1)	22	(37.9)	0.313, 2	0.86
	Multigravida	200	(46.7)	128	(64.0)	72	(36.0)		
	Grand multigravida	170	(39.7)	112	(65.9)	58	(34.1)		
Parity	Primiparous	98	(22.9)	35	(35.7)	63	(64.3)	63.1, 2	<0.01
	Multiparous	206	(48.1)	133	(64.6)	73	(35.4)		
	Grand multiparous	124	(29.0)	108	(87.1)	16	(12.9)		

to have good knowledge of prevention and home-based management diarrhoea among children under five (Table 5).

Participants practiced home-based management of diarrhoea among children under five and associated factors

Presented in Table 5 is the analysis for the participants practice regarding prevention and home-based management of diarrhoea in children under five and associated factors, the captured parameters were educational level, monthly income, family size, parity, knowledge score and four attitude questions. The odds of good practice of home-based management of diarrhoea increased with an increase in the level of education of study participants with participants who had primary, secondary and tertiary education as 1.48

(CI = 2.02–5.22; $p = 0.0039$), 3.21 (CI = 3.16–6.23; $p = 0.01$) and 7.21 (CI = 5.24–16.5; $p < 0.01$) times likely to practice good home-based management of diarrhoea in children under five than those with no formal education.

Also, as monthly income (Gh¢) increased from between 1000 and 1999 and between 2000 and 3999 and above 4000, there was a corresponding 3.28 (CI = 0.27–3.3; $p = 0.02$), 7.08 (CI = 2.38–12.5; $p < 0.01$) and 12.4 (CI = 4.80–33.3; $p < 0.01$) increase in odds of a respondent's good practice. Multigravida and grand multigravida participants were more likely to have good home-based management practices of diarrhoea among children under five. Multiparous respondents were 2.88 (CI = 2.16–5.32; $p = 0.01$) times more likely to have good practice with grand multiparous respondents being 4.25 (CI = 1.78–6.36; $p = 0.01$) times more likely to practice good home-based management of diarrhoea in children aged <5 years. Similarly, respondent

TABLE 5 Multivariable logistic regression analysis of mothers' knowledge regarding prevention and home-based management of diarrhoea among children under five.

Variable	Category	COR	(95% CI)	p Value	AOR	(95% CI)	p Value
Educational level	None	1			1		
	Primary	3.72	(2.09–6.60)	<0.0001	2.26	(3.88–8.10)	<0.01
	Secondary	3.56	(2.06–6.12)	<0.0001	4.06	(3.01–7.17)	<0.01
	Tertiary	5.94	(2.68–12.40)	<0.0001	6.54	(1.68–10.40)	<0.01
Employment status	Unemployed	1			1		
	Employed	4.25	(2.46–7.56)	<0.0001	3.36	(1.46–5.56)	<0.01
	Self-employed	1.02	(0.60–1.53)	<0.0001	2.21	(1.01–2.66)	<0.01
Family size	≤5	1			1		
	>5	1.78	(1.16–2.69)	0.009	2.02	(2.16–4.91)	0.05
Parity	Primiparous	1			1		
	Multiparous	3.28	(1.97–5.48)	<0.0001	4.01	(3.23–7.15)	<0.01
	Grand multiparous	12.2	(6.11–23.00)	<0.0001	10.12	(6.11–23.00)	<0.01

with larger household size and good knowledge were 2.4 (3.42–6.40; $p = 0.03$) and 3.31 (CI = 4.16–8.22; $p < 0.01$) times likely to practice good home-based management of diarrhoea in children under five (Tables 6 and 7).

DISCUSSION

Residents of informal settlements in many developing LMICs have relatively high prevalence of diarrhoea and diarrhoea-related diseases due to high population density, poor sanitation, lack of consistent access to clean water and proximity to household animals, which promote the spread of these infectious diseases. Mothers are the burden bearers during children's diarrhoea episodes. As such, maternal knowledge in the home-based management of diarrhoea and diarrhoea-related disease, the aim of this study, can play a significant role in the reduction of this public health menace.

Participants with good knowledge of the prevention and home-based management of diarrhoea in children under five can effectively handle childhood diarrhoea. For the overall knowledge score, our study in Ghana is consistent with studies in Ethiopia¹⁵ and Iran,²⁶ while differing from a study from Senegal.²⁷ With about a third of participants having a poor knowledge in our study, there are opportunities for improved education of the public, especially pregnant women in these urban informal settlements.

Various causes of diarrhoea including parasites,²⁸ contaminated food and water,^{3,8,29} geophagia^{3,30} and poor hygiene^{12,29} have been reported widely in literature. In this study, mothers were able to identify poor hygiene,

contaminated food, contaminated water and intestinal parasites as causes of diarrhoea among children under five. However, some mothers attributed childhood diarrhoea to teething which must be of concern to healthcare providers. This is because mothers may attend to it less seriously when they assume it to be caused by teething.³¹ Mothers' ability to identify causes of diarrhoea may be a good indicator of their ability to ensure their children do not experience diarrhoea.¹⁵ Also, if mothers are able to identify danger signs associated with diarrhoea in their children, they will be able to seek medical care promptly.¹²

Maternal identification of weakness or lethargy and dehydration as the danger signs associated with diarrhoea among children noted in this study has been reported by mothers in studies in Saudi Arabia,¹⁶ Ethiopia,^{14,15,18} Nigeria¹³ and Senegal.²⁷ This is to be expected as the Ministry of Ghana has consistently been promoting the education of infectious diseases resulting in diarrhoea because of their public health importance.

Maternal educational status,^{11,12} parity,¹² and employment status,¹² being significantly associated with good knowledge of diarrhoea prevention and home management practices these reports were consistent with findings obtained in this study. In this study parity, educational level, family size and employment status were significantly associated with good knowledge among the respondents. Mothers who were multiparous and grand multiparous were four- and ten-times more likely to have good knowledge of the prevention and home-based management diarrhoea among children under five. Similarly, mothers with a family size of more than 5 were two times more likely to have good knowledge. In most households in Ghana, the health care of children at home is mostly provided by the mothers. These mothers who

TABLE 6 Factors associated with mothers' practice regarding prevention and home-based management of diarrhoea among children under five.

Variable	Category	Practice				X^2 , df	p Value
		Good		Poor			
		n	(%)	n	(%)		
Educational level	None	18	(19.6)	74	(80.4)	37.4, 3	<0.01
	Primary	41	(33.6)	81	(66.4)		
	Secondary	64	(39.8)	97	(60.2)		
	Tertiary	37	(69.8)	16	(30.2)		
Monthly income(Gh¢)	below 1000	21	(14.1)	128	(85.9)	88.3, 3	<0.01
	between 1000 and 1999	42	(32.1)	89	(67.9)		
	between 2000 and 3999	67	(62.0)	41	(38.0)		
	4000 and above	30	(75.0)	10	(25.0)		
Family size	≤5	88	(32.8)	180	(67.2)		0.01
	>5	72	(45.0)	88	(55.0)		
Parity	Primiparous	19	(19.4)	79	(80.6)	28.7, 2	<0.01
	Multiparous	78	(37.9)	128	(62.1)		
	Grand multiparous	63	(55.3)	51	(44.7)		
Knowledge score	Poor	28	(18.4)	124	(81.6)		<0.01
	Good	132	(47.8)	144	(52.2)		
Oral rehydration fluids are the first line treatment of diarrhoea in children							
	Agree	140	(42.9)	186	(57.1)	19.8, 2	<0.01
	Neutral	8	(14.0)	49	(86.0)		
	Disagree	12	(26.7)	33	(73.3)		
ORS is better than traditional medicine in diarrhoea management						21.4, 2	<0.01
	Agree	132	(44.6)	164	(55.4)		
	Neutral	16	(22.2)	56	(77.8)		
	Disagree	12	(20.0)	48	(80.0)		
Exclusive breastfeeding can prevent diarrhoea							
	Agree	116	(41.4)	164	(58.6)	6.71, 2	0.03
	Neutral	12	(37.5)	20	(62.5)		
	Disagree	32	(27.6)	84	(72.4)		
Mothers hand hygiene practice can prevent diarrhoea							
	Agree	112	(50.9)	108	(49.1)	8.15, 2	0.02
	Neutral	26	(40.6)	38	(59.4)		
	Disagree	52	(36.1)	92	(63.9)		

must take care of successive children may have more knowledge due to various experiences acquired from the management of previous cases of diarrhoea in children. Similarly, an increase in educational level of the mothers was also associated with an increase of two odds of having good knowledge. The implications of education on health is that it creates better self-awareness of personal health and health-

seeking behaviour.³² Also, education may result in increased knowledge¹² and attention to preventive care with associated long-term benefits.^{27,32}

In terms of attitude, the 67.3% of mothers who agreed that diarrhoea is preventable and manageable at home, is higher than the 45% reported in a study conducted in Ethiopia.¹⁵ In this study, most of the participants agreed

TABLE 7 Multivariable logistic regression analysis of mothers' practice regarding prevention and home-based management of diarrhoea among children under five.

Variable	Category	COR	(CI)	p Value	AOR	(CI)	p Value
Educational level	None	1			1		
	Primary	2.08	(1.09–3.92)	0.0229	1.48	2.02–5.22	0.01
	Secondary	2.71	(1.47–4.83)	0.0010	3.21	3.16–6.23	0.01
	Tertiary	9.51	(4.24–20.5)	<0.0001	7.21	5.24–16.5	<0.01
Monthly income (Gh¢)	below 1000	1			1		
	between 1000 and 1999	2.88	(1.57–5.16)	0.0003	3.28	0.27–3.3	0.02
	between 2000 and 3999	9.96	(5.38–18.5)	<0.0001	7.08	2.38–12.5	<0.01
	4000 and above	18.3	(7.80–43.4)	<0.0001	12.4	4.80–33.3	<0.01
Family size	≤5	1			1		
	>5	1.67	(1.12–2.50)	0.0133	2.4	3.42–6.40	0.03
Parity	Primiparous	1			1		
	Multiparous	2.53	(1.46–4.52)	0.0012	2.88	2.16–5.32	0.01
	Grand multiparous	5.14	(2.78–9.36)	<0.0001	4.25	1.78–6.36	0.01
Knowledge score	Poor	1			1		
	Good	4.06	(2.56–6.56)	<0.0001	3.31	4.16–8.22	<0.01
Oral rehydration fluids are the first line treatment of diarrhoea in children							
	Agree	1			1		
	Neutral	0.217	(0.13–0.46)	<0.0001	0.4	0.52–0.97	<0.01
	Disagree	0.483	(0.250–0.95)	0.0374	0.54	0.4–1.02	0.04
ORS is better than traditional medicine in diarrhoea management							
	Agree	1			1		
	Neutral	0.355	(0.20–0.64)	0.0005	0.22	0.57–0.89	0.04
	Disagree	0.311	(0.16–0.60)	0.0004	0.42	0.34–0.92	0.0004
Exclusive breastfeeding can prevent diarrhoea							
	Agree	1					
	Neutral	0.848	0.402–1.76	0.6686	-	-	-
	Disagree	0.539	(0.34–0.86)	0.0096	0.61	0.51–1.50	0.01
Mothers hand hygiene practice can prevent diarrhoea							
	Agree	1			1		
	Neutral	0.66	0.375–1.17	0.1474	-	-	-
	Disagree	0.545	0.36–0.84	0.0055	0.37	0.62–1.03	0.01

that oral rehydration fluids as a better alternative to traditional medicine to manage diarrhoea is more than the 35.4% reported by Mumtaz et al.²⁹ However, a study conducted by Osonwa Kalu et al.³³ in Nigeria reported that 62.5% of participant disagreed that oral rehydration is a

better alternative. Most participants agreed that oral rehydration fluids as a better alternative to traditional medicine to manage diarrhoea is encouraging as Momoh et al.¹³ and reported that mothers with good attitude are able to make better choice towards the prevention and

home base management to childhood diarrhoea. Again a general population study by Visser et al.,³⁴ reveal that individual with better health-related attitude have a good overall health practices and outcomes.

About 37.4% (160/428) of the mothers had good practice towards prevention and home-based management of diarrhoea among children under five, which is similar to the 37.6% and 33.8% reported in the study conducted in Ethiopia¹² and Nigeria, respectively.¹³ However, it is lower than the reported 59.2% in Ethiopia by Terefe et al.¹⁴ and 75.5% in Pakistan by Mumtaz et al.²⁹ Many studies have reported that factors associated with the practice of home-based management of diarrhoea may be categorised into the following: sociocultural factors (idea of self-care, influence and advice from relatives or friends and health-seeking behaviours); health system-related factors (long delay at health facilities, lack of trust in the health facilities and workers); and economic factors (individual or family income status and money saving ability).³⁵ In this study, educational level, monthly income, family size, parity, knowledge score and good attitude were significantly associated with good prevention practices and home-based management of diarrhoea among children under five.

Formal education helps people develop cognitive and problem-solving abilities that propel them towards improved health outcome.³² Hence, educated mothers will be proactive in preventing diarrhoea among their children by conducting good preventive and management practice. Socioeconomic and income status are health determinants and are associated with disease risk. Several disease are more prevalent in people with low socioeconomic status.³⁶ Mothers with high income can afford the cost of giving the affected child more fluids to augment their breastfeeding in times of diarrhoea. Furthermore, an increased knowledge can improve mothers' practice towards prevention and home-based management of diarrhoea among children under five. Hence the mothers with good knowledge were three times more likely to prevent and manage diarrhoea among children under five at home.

CONCLUSION

The knowledge level of participants was good, but few had good practice of the prevention and home-based management of diarrhoea among children under 5 years. Parity, educational level, family size and employment status were the respondents' main predictors of good knowledge. Also, educational level, monthly income, family size, parity, knowledge score and four attitude questions were predictors of participants' good practice of prevention and home-based management of diarrhoea. These findings may serve as the basis for developing specific interventions to enhance good knowledge and good practice regarding home-based management of diarrhoea among children under five among informal settlers in urban communities. Antenatal

and postnatal clinics should be good platforms for educating these mothers on the prevention and home-based management of diarrhoea among children under five, particularly in urban informal settlements.

LIMITATIONS OF THE STUDY

The study's limitations are first, results were solely based on respondents' answers; therefore, no observational study was conducted to confirm preventive and management practices. Also, some of the questions on practices were based on recall of past events; thus, the accuracy and volume of information may have been influenced.

AUTHOR CONTRIBUTIONS

Ezekiel K. Vicar, Kwame Opare-Asamoah and Mildred G. O. Marfo Conceptualised and designed the study. Mildred G. O. Marfo, George K. Darko, Mauvina Obeng-Bempong did the data collection. Ezekiel K. Vicar, Williams Walana, Emmanuel K. Osabutey and Majeed S. Folorunsho did data analysis. Ezekiel K. Vicar, Williams Walana and Kwame Opare-Asamoah wrote the first draft of the manuscript, Ezekiel K. Vicar, Williams Walana, Mildred G. O. Marfo, George K. Darko, Emmanuel K. Osabutey, Mauvina Obeng-Bempong, Kwame Opare-Asamoah, Majeed S. Folorunsho reviewed and edited the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

We acknowledge all the households who participated in the studies. We are also grateful to all our field staff.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All data supporting the findings of this study are included within the article. Any other information will be made available by requesting through the corresponding author.

ETHICS STATEMENT

Ethical approval for the study was granted by the University for Development Studies Institutional Review Board, Tamale, Ghana (UDS/RB/028/23). Written informed consent was obtained from all participants after explaining the study objectives, risks, benefits, right to refuse and confidentiality. Participation was purely based on volunteerism. The identity and data of participants were kept confidential.

ORCID

Ezekiel K. Vicar  <http://orcid.org/0000-0002-1232-4921>
Williams Walana  <http://orcid.org/0000-0002-2938-1332>
George K. Darko  <http://orcid.org/0000-0002-7253-2335>
Majeed S. Folorunsho  <http://orcid.org/0000-0002-5576-2534>

Emmanuel K. Osabutey  <http://orcid.org/0009-0005-3350-7806>

Mauvina Obeng-Bempong  <http://orcid.org/0000-0001-7165-371X>

Kwame Opare-Asamoah  <http://orcid.org/0000-0002-6929-6263>

REFERENCES

1. The United Nations Inter-agency Group for Child Mortality Estimation. Levels & Trends in Child Mortality: Report 2022, Estimates developed by the United Nations Inter-agency Group for Child Mortality Estimation; 2023.
2. Walker CLF, Rudan I, Liu L, et al. Global burden of childhood pneumonia and diarrhoea. *Lancet*. 2013;381(9875):1405-1416. doi:10.1016/s0140-6736(13)60222-6
3. Fuhrmann S, Winkler MS, Stalder M, et al. Disease burden due to gastrointestinal pathogens in a wastewater system in Kampala, Uganda. *Microbial Risk Analysis*. 2016;4:16-28. doi:10.1016/j.mran.2016.11.003
4. Troeger C, Forouzanfar M, Rao PC, et al. Estimates of global, regional, and national morbidity, mortality, and aetiologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study. *Lancet Infect Dis*. 2017;17(9):909-948.
5. Owusu DN, Duah HO, Dwomoh D, Alhassan Y. Prevalence and determinants of diarrhoea and acute respiratory infections among children aged under five years in West Africa: evidence from demographic and health surveys. *Int Health*. 2023;16:97-106. doi:10.1093/inthealth/ihad046
6. Nadimpalli ML, Marks SJ, Montealegre MC, et al. Urban informal settlements as hotspots of antimicrobial resistance and the need to curb environmental transmission. *Nat Microbiol*. 2020;5(6):787-795. doi:10.1038/s41564-020-0722-0
7. Omulo S, Lofgren ET, Lockwood S, et al. Carriage of antimicrobial-resistant bacteria in a high-density informal settlement in Kenya is associated with environmental risk-factors. *Antimicrob Resist Infect Control*. 2021;10(1):18. doi:10.1186/s13756-021-00886-y
8. Nadimpalli ML, Marks SJ, Montealegre MC, et al. Urban informal settlements as hotspots of antimicrobial resistance and the need to curb environmental transmission. *Nat Microbiol*. 2020;5(6):787-795. doi:10.1038/s41564-020-0722-0
9. Fink G, Günther I, Hill K. Slum residence and child health in developing countries. *Demography*. 2014;51(4):1175-1197. doi:10.1007/s13524-014-0302-0
10. Mberu BU, Haregu TN, Kyobutungi C, Ezeh AC. Health and health-related indicators in slum, rural, and urban communities: a comparative analysis. *Glob Health Action*. 2016;9:33163. doi:10.3402/gha.v9.33163
11. Gazi E, Chowdhury A, Kumar R, Sarkar AP, Basu S, Saha S. Can mothers care for acute diarrhoeal disease of their under five children effectively at home? A cross-sectional study in slum community in bankura. *J Evid Based Med Healthc*. 2015;2(36):5575-5584.
12. Desta BK, Assimamaw NT, Ashenafi TD. Knowledge, practice, and associated factors of Home-Based management of diarrhea among caregivers of children attending under-five clinic in Fagita Lekoma District, Awi Zone, Amhara Regional State, Northwest Ethiopia, 2016. *Nurs Res Pract*. 2017;2017:1-8. doi:10.1155/2017/8084548
13. Momoh FE, Olufela OE, Adejimi AA, et al. Mothers' knowledge, attitude and home management of diarrhoea among children under five years old in Lagos, Nigeria. *Afr J Prim Health Care Fam Med*. 2022;14(1):1. doi:10.4102/phcfm.v14i1.3119
14. Terefe G, Murugan R, Bedada T, Bacha G, Bekele G. Home-based management practice of diarrhea in under 5 years old children and associated factors among caregivers in Ginchi town, Oromia region, west Ethiopia. *SAGE Open Med*. 2022;10:205031212210957. doi:10.1177/20503121221095727
15. Workie HM, Sharifabdilahi AS, Addis EM. Mothers' knowledge, attitude and practice towards the prevention and home-based management of diarrheal disease among under-five children in Dire Dawa, Eastern Ethiopia, 2016: a cross-sectional study. *BMC Pediatr*. 2018;18(1):358. doi:10.1186/s12887-018-1321-6
16. Alghadeer S, Syed W, Alhossan A, et al. Assessment of Saudi mother's knowledge and attitudes towards childhood diarrhea and its management. *Int J Environ Res Public Health*. 2021;18(8):3982.
17. Vicar EK, Walana W, Mbabila A, et al. Drivers of household antibiotic use in urban informal settlements in Northern Ghana: implications for antimicrobial resistance control. *Health Sci Rep*. 2023;6(7):e1388. doi:10.1002/hsr2.1388
18. Shewangizaw B, Mekonen M, Feku T, et al. Knowledge and attitude on home-based management of diarrheal disease among mothers/caregivers of under-five children at a tertiary hospital in Ethiopia. *Pan African Med J*. 2023;44:38. doi:10.11604/pamj.2023.44.38.34431
19. Othoro D, Orago A, Groenewegen T, Kaseje D, Otengah P. Home management of diarrhea among underfives in a rural community in Kenya: household perceptions and practices. *East Afr J Public Health*. 2009;5(3):142-146. doi:10.4314/eajph.v5i3.38992
20. Merga N, Alemayehu T. Knowledge, perception, and management skills of mothers with under-five children about diarrhoeal disease in indigenous and resettlement communities in Assosa District, Western Ethiopia. *J Health Popul Nutr*. 2015;33(1):20-30.
21. Ghana Statistical Service. 2010 Population & Housing Census: Regional Analytical Report. vol. 1. Ghana Statistical Service; 2013.
22. Tamale Metropolitan Assembly. Tamale Metropolitan Assembly Profile. 2023. <https://tamalemetro.gov.gh/about-tamale/>
23. Vicar EK, Walana W, Mbabila A, et al. Drivers of household antibiotic use in urban informal settlements in Northern Ghana: implications for antimicrobial resistance control. *Health Sci Rep*. 2023;6(7):1388. doi:10.1002/hsr2.1388
24. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. *Gastroenterol Hepatol Bed Bench*. 2013;6(1):14-17.
25. Bulabula ANH, Dramowski A, Mehtar S. Antibiotic use in pregnancy: knowledge, attitudes and practices among pregnant women in Cape Town, South Africa. *J Antimicrob Chemother*. 2019;75(2):473-481. doi:10.1093/jac/dkz427
26. Ghasemi AA, Talebian A, Masoudi Alavi N, Moosavi GA. Knowledge of mothers in management of diarrhea in under-five children, in Kashan, Iran. *Nurs Midwifery Stud*. 2013;1(3):158-162.
27. Thiam S, Sy I, Schindler C, et al. Knowledge and practices of mothers and caregivers on diarrhoeal management among under 5-year-old children in a medium-size town of Senegal. *Acta Trop*. 2019;194:155-164. doi:10.1016/j.actatropica.2019.03.013
28. Mbae CK, Nokes DJ, Mulinge E, Nyambura J, Waruru A, Kariuki S. Intestinal parasitic infections in children presenting with diarrhoea in outpatient and inpatient settings in an informal settlement of Nairobi, Kenya. *BMC Infect Dis*. 2013;13(1):243. doi:10.1186/1471-2334-13-243
29. Mumtaz Y, Zafar M, Mumtaz Z. Knowledge attitude and practices of mothers about diarrhea in children under 5 years. *J Dow Univer Health Sci*. 2014;8(1):3-6.
30. Kumi-Kyereme A, Amo-Adjei J. Household wealth, residential status and the incidence of diarrhoea among children under-five years in Ghana. *J Epidemiol Global Health*. 2016;6(3):131-140. doi:10.1016/j.jegh.2015.05.001
31. DenBesten P. Is teething associated with diarrhea? *West J Med*. 2000;173(2):137. doi:10.1136/ewj.173.2.137
32. Raghupathi V, Raghupathi W. The influence of education on health: an empirical assessment of OECD countries for the period 1995-2015. *Arch Public Health*. 2020;78(1):20. doi:10.1186/s13690-020-00402-5
33. Osonwa Kalu O, Eko Jimmy E, Ema S. Utilization of oral rehydration therapy in the management of diarrhea in children among nursing

- mothers in Odukpani local government area of cross River State, Nigeria. *Am J Public Health Res.* 2016;4(1):28-37.
34. Visser P, Krosnick J, Norris CJ. Attitude importance and attitude-relevant knowledge. In: Krosnick JA, Chiang I-CA, Stark TH, eds. *Political Psychology: New Explorations*. Routledge/Taylor & Francis Group; 2016:203-245.
 35. Latunji OO, Akinyemi OO. Factors influencing health-seeking behaviour among civil servants in Ibadan, Nigeria. *Ann Ib Postgrad Med.* 2018;16(1):52-60.
 36. The Lancet Public Health. Income, health, and social welfare policies. *Lancet Public Health.* 2020;5(3):e127. doi:10.1016/S2468-2667(20)30034-7

How to cite this article: Vicar EK, Walana W, Marfo MGO, et al. Prevention and home-based management of childhood diarrhoea in an urban informal settlement in Northern Ghana; a cross-sectional study of maternal knowledge, attitude and practices. *Reprod Female Child Health.* 2024;3:e101. doi:10.1002/rfc2.101