

# Factors influencing diarrheal prevalence among children under five years in Mathare Informal Settlement, Nairobi, Kenya

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## Abstract

Globally, diarrhoea is the second major cause of death among children under five years. The aim of the study was to establish factors influencing diarrhoeal prevalence among children under five years in Mathare Informal Settlement. Cross-sectional survey was used. Data was collected from 1<sup>st</sup> July to 1<sup>st</sup> August 2019 among primary caregivers (PCGs) of children under five years in Mathare Informal Settlement, in Nairobi, Kenya. This urban informal settlement in Kenya was purposively sampled. Simple random sampling was used to select the households and the respondents.  $P < 0.05$  was considered as statistically significant. A total of 324 primary caregivers selected from 324 households were included in the study. Fifty six point seventeen percent of the respondents were aged 25-31 years old. Prevalence of diarrhoea among children was 18.7%. Sex, relationship of the primary caregivers, number of people and children in the households were found to be statistically significant with diarrhoea prevalence with  $p = 0.008$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p < 0.001$  respectively. One hundred and seventy one (52.78%) primary caregivers had no formal education. primary caregivers disposed of the child's faeces in garbage in 38.89% of the cases. Education level of the primary caregivers, renting, presence of flies, faeces, and open garbage near or within the compound were found to be associated with diarrhoea prevalence with  $p < 0.001$ ,  $p = 0.024$ ,  $p < 0.001$ ,  $p < 0.001$  respectively. Several factors were found to be associated with diarrhoeal prevalence among children under five years.

## Introduction

Globally, the burden of diarrhoeal infections among children under five years remains high. According to World Health Organization (WHO), diarrhoea is one of the major causes of death among children

under five years worldwide and it is classified as the second main cause of death. Every year, there is an estimated number of 1.7 billion cases of diarrhoea amongst children under five years. WHO estimates that every year, around 525,000 children under five years die due to diarrhoeal disease.<sup>1</sup> In Kenya, during the year 2018, 1,499,146 cases of diarrhoea were reported among children under five years. Among the cases of diarrhoea in 2018 in Kenya, Nairobi accounted for 136,028 cases.<sup>2</sup>

A study showed that in 2017, 25.6% of children living in Nairobi Informal Settlement had diarrhoea. Although in the same study, the exact prevalence of diarrhoea among children in Mathare Informal Settlement was not mentioned, Primary Caregivers (PCGs) reported that their children contract diarrhoea at least once every two weeks.<sup>3</sup> PCGs play an important role in the management process of diarrhoea as they are the first person directly related to the child. There are limited studies on the factors influencing diarrhoeal prevalence among children under five years in Mathare Informal Settlement. As diarrhoea is mostly managed at home by PCGs, we need to establish factors influencing management practices in order to come up with effective health promotion programmes. The study therefore aims at establishing factors influencing diarrhoeal prevalence among children under five years in Mathare Informal Settlement, in Nairobi, Kenya.

## Materials and Methods

### Study area

The study took place in Mathare Informal Settlement, located within Nairobi, Kenya. Mathare is exactly located at latitude 1°15'42.88"S and longitude 36°51'30.53"E. The study focused on three villages of Mathare: Gitathuru, 4A, and 4B.

### Study design

Due to the variables, the lower cost of the study design, as well as the fact that it can be applied to many people within a short period of time, cross sectional survey was utilized. It was a community based study.

### Study variables

The following were considered independent variables: age group of the PCG, sex of the PCG, relationship of the PCG, number of household (HH) residents, number of children under five years in a HH, education level of the PCG, occupation of the PCG, monthly income, rent, type of

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latrine used, presence of flies near/within the HH, presence of open garbage, presence of faeces near/within the HH, hand washing practices after using the toilet, hand washing practices after disposing of the child's faeces and the reason, place of defecation of the child, age when the child starts using latrine, disposal of the child's faeces, immunization practices. The following were considered as dependent variables: diarrhoea prevalence among children under five years during the two last weeks preceding the data collection.

### Study population

The study targeted PCGs of children

under five years living in the selected villages of Mathare Informal Settlement. A PCG is the individual directly responsible, particularly for a child.

### Inclusion criteria

Participants were eligible for the study if they met the following inclusion criteria: PCG of children under-five years; Only children under the responsibility of the selected PCG; One PCG per selected households.

### Exclusion criteria

The study excluded PCG of children under-five years who were unwilling to participate in the study.

### Sampling techniques

Mathare Informal Settlement was purposively sampled because of the frequency of diarrhoea reported by PCGs. Simple random sampling was applied to select the three villages (Gitathuru, 4A, and 4B), the households, and the respondents.

### Sample size determination

The formula by Fischer *et al.*<sup>4</sup> was used:

$$n = \frac{z^2pq}{d^2}$$

with,

n = desired sample size

z = the 95% of confidence interval which is 1.96

p = the proportion of people in the target population estimated to have the characteristic that is measured. p=25.6%=0.256.<sup>3</sup>

q = 1 - p=0.744

d = the level of statistical significance which is 0.05

$$n = \frac{1.96^2 * 0.256 * (1 - 0.256)}{0.05^2}$$

n= 292.67

n=293

A minimum of 293 PCGs was required. The research adopted 324 as sample size. The proportionate probability was used to calculate the respondents according to the selected villages. Village 4A has 5627 households, village 4B has 1810 households, and Gitathuru has 1241 households.<sup>5</sup> The total number of households in the selected villages is 8678. In this study, 210 households were targeted in village A, 68 in village B and 46 in Gitathuru.

## Data collection techniques and data analysis

Data was collected from 1<sup>st</sup> July to 1<sup>st</sup> August 2019 using interview schedule as well as observation checklist and entered into Epi-info version 7 software (CDC, Atlanta, Georgia, USA). IBM SPSS version 21 software (IBM Corp., Armonk, New York, USA) was used for analysis. Pearson Chi-square and Pearson correlation were performed. For value less than 5, Fisher's and exact test was performed. The level of confidence used is 95%. P<0.05 was considered as statistically significant.

## Study approvals and ethical considerations

Ethical approval was obtained from Kenyatta University Ethics Review Committee under the approval number PKU/1001/11051. Authority was sought by the National Commission for Science, Technology, and Innovation under the permit NACOSTI/P/19/57924/31181. Clearance to conduct the research was obtained from the County Director of Health, the County Commissioner, and the County Director of Education. Informed consent was obtained from the participants.

## Results

### Demographic characteristics of primary caregivers and prevalence of diarrhoea among children under five years in the selected households

#### Demographic characteristics of primary caregivers

The majority of the respondents 182 (56.17%) were aged between 25-31 years. The selected households' size ranged between 2 to 15 people. The majority of the PCGs 112 (34.6%) were 4 to 5 in a household (HH). Eighty six (26.5%) respondents were 6 to 7 per HH. Only 1 respondent (0.3%) was living in a HH size of 14 people. Six hundred and thirty one children under five years were living in the selected HH of the study. The number of children under five years per selected HH ranged from 1 to 7. One hundred and sixty children 160(49.4%) were 1 per HH (Table 1).

#### Prevalence of diarrhoea among children under five years in the selected households

Among the 631 children, 118 cases of diarrhoea were reported within the two weeks preceding the study. Therefore, that makes a prevalence of 18.7%.

### Demographic factors of primary caregivers and prevalence of diarrhoea among children under five years in the selected households

Sex, relationship of the PCG, number of HH resident, and number of children under five years in the HH were found to be statistically significant with the prevalence of diarrhoea among children under five years with p=0.008, p<0.001, p<0.001, and p<0.001 respectively. Females were found to be at greater risk (r = -0.156). The higher the number of HH resident, the greater the likelihood of diarrhea (r = -0.320). This applies also to the number of children under five years per HH (r = - 0.505) (Table 2).

### Factors influencing diarrhoeal prevalence among children under five years in Mathare Informal Settlement

#### Socio economic factors

Only 90 respondents (27.8%) owned a house. Out of the 324 respondents, 259 (79.9%) were earning less or equal to 10,000 Kenya shillings per month. Only 3 respondents (0.9%) had fixed term contract. Five (1.5%) respondents attended university (Table 2).

#### Environmental factors

Observation was performed. Faeces were present near or within a house in 106 HH (37.72%), garbage was present near or within the compound in 192 HH (59.26%). Flies were present near or within the compound in 260 HH (80.25%) (Table 2).

#### Behavioural factors

The research identified three categories of behavioural factors: hygiene practices, sanitation practices, and immunization practices.

All the respondents stated that they wash their hands after coming out from the latrine because the public latrine had hand washing facility and soap. However, 90 respondents (27.78%) did not wash their hands after disposing of the child's faeces. One hundred and twenty six PCGs (38.89%) disposed of the child's faeces in garbage. Those 126 PCGs (38.89%) who disposed of the child's faeces in garbage and the 6 PCGs (1.85%) whose children directly defecated in an open space, the reason was poverty. Those who disposed of the child's faeces in a latrine 150 (46.3%) plus those 42 PCGs (12.96%) whose child defecated directly in a latrine stated that they want to keep the environment clean (Table 2). The study went further to perform a cross tabulation between the factors and

diarrhoea prevalence among children under five year in the selected households. The results showed that the level of education of the PCG, renting, presence of flies near or within the compound, presence of faeces near or within the compound, presence of open garbage near or within the compound, immunization practices, and age when children start using latrine were found to have a statistical significance with diarrhoea prevalence among children under five years with  $p < 0.001$ ,  $p = 0.024$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p < 0.001$  respectively. Non immunization was associated with high prevalence ( $r = -0.172$ ). Low level of education, not owning a house, presence of flies, presence of open garbage and presence of faeces were associated with high prevalence of diarrhoea among children under five years (Table 2).

## Discussion

The prevalence of diarrhoea among children under five years in the selected households was 18.7%. This finding on prevalence of diarrhoea among children under five years is similar to the study con-

ducted in Ethiopia where the two weeks prevalence of diarrhoea among children under five years was 22.5%.<sup>6</sup> Similar results were obtained in a study done in Turkana County in Kenya where the two weeks prevalence was 16.5%.<sup>7</sup> Diarrhoea among children under five years was predominant among young PCGs. This demonstrates that PCGs were mature enough to answer the questions. This finding corroborates with a study conducted in Nepal, which showed that majority of PCGs whose child experienced diarrhoea were young. This can be explained by lack of prior experiences.<sup>8</sup> The study established that sex female of the PCG was associated with the occurrence of diarrhoea among children under five years. This can be explained by the fact that the majority of the PCGs (307, 94.8%) were female. The prevalence of diarrhoea was high in households with high number of people as well as households with high number of children under five years. This study demonstrates that crowded housing condition is a predictor of diarrhoea occurrence among children under five years. Other researches also showed that the high number of children under five years in a household was a predictor of diarrhoea

among children.<sup>6,9</sup> This could be attributed to the PCG failure to look after many kids. The study also found that risk of diarrhoea occurrence among children was low if the PCG was the biological parent (mother or father). This could be explained by the fact that a biological parent cares more about the health of his/her child.

PCGs with no formal education recorded high prevalence of diarrhoea among children under five years. Low education level of the PCG was associated with the occurrence of diarrhoea among children under five years. Similar results were obtained by a study conducted in Northeast Ethiopia. Children of the PCGs who were self-employed, casual workers, had fixed termed, and housewives experienced diarrhoea but the difference was not significant. This result differs from the study conducted in Northeast Ethiopia where occupation of the PCG was associated with diarrhoea prevalence among children under five years. This could be explained by the study area where the majority of PCGs in Northeast Ethiopia are housewives.<sup>10</sup> PCGs who were renting recorded high prevalence of diarrhoea among children under five years. Owning a house was associated with

**Table 1. Demographic characteristics of primary caregivers and prevalence of diarrhoea among children under five years in the selected households, Mathare Informal Settlement, Nairobi, Kenya, July-August 2019.**

Variables	Category	Frequency	Percentage	Diarrhoea prevalence		Fisher's exact test and Pearson's R
				Yes, N(%)	No, N(%)	
Age group of the PCG	18-24	30	9.26	7(23.3)	23(76.7)	p=0.277
	25-31	182	56.17	66(36.3)	116(63.7)	
	32-38	73	22.53	32(43.8)	41(56.2)	
	39-45	30	9.26	8(26.7)	22(73.3)	
	46-52	3	0.93	1(33.3)	2(66.7)	
	53-59	1	0.31	1(100)	0(0)	
	60-66	3	0.93	2(66.7)	1(33.3)	
	67-73	2	0.62	1(50)	1(50)	
Sex of the PCG	Female	307	94.80	117(38.1)	190(61.9)	p=0.008*
	Male	17	5.20	1(5.9)	16(94.1)	
Relationship of the PCG	Mother	271	83.60	94(34.7)	177(65.3)	p<0.001* r= - 0.123
	Father	15	4.60	1(6.7)	14(93.3)	
	Grandmother	27	8.30	17(63)	10(37)	
	Aunt	9	2.80	6(66.7)	3(33.33)	
	Uncle	2	0.60	0(0)	2(100)	
Number of HH residents	02-03	13	4	4(30.8)	9(69.2)	p<0.001* r= - 0.320
	04-05	112	34.6	25(22.3)	87(77.7)	
	06-07	86	26.5	25(29.1)	61(70.9)	
	08-09	56	17.3	27(48.2)	29(51.8)	
	10-11	45	13.9	27(60)	18(40)	
	12-13	11	3.4	9(81.8)	2(18.2)	
	14-15	1	0.3	1(100)	0(0)	
	Number of children under five years in the HH	1	160	49.4	29(18.1)	
2		85	26.2	28(32.9)	57(67.1%)	
3		47	14.5	30(63.8)	17(36.2)	
4		15	4.6	14(93.3)	1(6.7)	
5		8	2.5	8(100)	0(0)	
6		3	0.9	3(100)	0(0)	
7		6	1.9	6(100)	0(0)	

HH=Household, N=Frequency, PCG=Primary caregiver, p=P-value, r=Pearson's R, \*statistically significant.

low risk of diarrhoea compare to renting a house. The government made an effort in building public latrines in Mathare and put it at an affordable price. All the respondents were using public latrines. However, despite the price, a study done in Mathare found that people were still using flying toilet in Mathare.<sup>11</sup> The difference could be explained by the study period. Since 2014, efforts were made by the authorities to

change behaviour.<sup>12</sup> Despite the efforts made to change behaviour, faeces were found around many compounds. Although the price for using a public latrine is low, some families have high number of children and they can't afford to pay for every child. Therefore, either they throw the faeces in the garbage or the child defecates on an open space. Presence of flies, presence of open garbage and presence of faeces near or

around the compound were found to be associated with occurrence of diarrhoea among children. These findings are similar to the finding of a study conducted in Ethiopia where open garbage was an independent risk factor for developing diarrhoeal diseases.<sup>6</sup> The easy reason could be that the unsuitable disposal of waste is a breeding ground for animals that can carry diarrhoeal pathogens from garbage or fae-

**Table 2. Factors influencing diarrhoea prevalence among children under five years in Mathare Informal Settlement, Nairobi, Kenya, July-August 2019.**

Variables	Category	Total N	%	Diarrhoea Prevalence Yes N(%)	No N(%)	$\chi^2$ /Fisher's exact test and Pearson's R
<b>Socio economic factors</b>						
Education level of the PCG	No formal education	171	52.8	101(59.1)	70(40.9)	$p < 0.001^*$ $r = 0.465$
	Primary school	78	24.1	11(14.1)	67(85.9)	
	Secondary school	70	21.6	6(8.6)	64(91.4)	
	University	5	1.5	0(0)	5(100)	
Occupation of the PCG	Self-employed	140	43.2	43(30.7)	97(69.3)	$p = 0.182$
	Casual worker	85	26.2	31(36.5)	54(63.5)	
	Fixed term	3	9	1(33.3)	2(66.7)	
	Housewife	96	29.6	43(44.8)	53(55.2)	
Monthly income (Kenya shillings)	$\leq 10\,000$	259	79.9	99(38.2)	160(61.8)	$\chi^2 = 1.815$ , $df = 1$ , $p = 0.178$
	$> 10\,000$	65	20.1	19(29.2)	46(70.8)	
Rent	Renting	234	72.2	94(40.2)	140(59.8)	$\chi^2 = 5.119$ , $df = 1$ , $p = 0.024^*$ $r = 0.126$
	Not renting	90	27.8	24(26.7)	66(73.3)	
Type of latrine used	Public latrine	324	100	118(36.4)	206(63.6)	NA
	Family latrine	0	0	0(0)	0(0%)	
<b>Environmental factors</b>						
Presence of flies near/ within the HH	Yes	260	80.25	111(42.7)	149(57.3)	$\chi^2 = 22.365$ , $df = 1$ , $p < 0.001^*$ $r = 0.263$
	No	64	19.75	7(10.9)	57(89.1)	
Presence of open garbage	Yes	192	59.26	86(44.8)	106(55.2)	$\chi^2 = 14.265$ , $df = 1$ , $p < 0.001^*$ $r = 0.210$
	No	132	40.74	32(24.2)	100(75.8)	
Presence of faeces near/ within the HH	Yes	106	37.72	55(51.9)	51(48.1)	$\chi^2 = 16.276$ , $df = 1$ , $p < 0.001^*$ $r = 0.224$
	No	218	62.28	63(28.9)	155(71.1)	
<b>Behavioural factors Hygiene practices</b>						
Hand washing practices after using the toilet	Washed their hands	324	100	118(36.4)	206(63.6)	NA
	Did not wash their hands	0	0	0(0)	0(0)	
Hand washing practices after disposing of the child's faeces and the reason	Washed their hands	218	67.28	74(33.9)	144(66.1)	$\chi^2 = 3.531$ , $df = 2$ , $p = 0.171$
	Didn't Wash their hands	90	27.78	35(38.9)	55(61.1)	
	Washed their hands sometimes	16	4.94	9(56.3)	7(43.8)	
<b>Sanitation practices</b>						
Place of defecation of the child	Potty	155	47.84	56(36.1)	99(63.9)	$p = 0.055$
	Latrine	42	12.96	9(21.4)	33(78.6)	
	Diapers	121	37.35	49(40.5)	72(59.5)	
	In an open space	6	1.85	4(66.7)	2(33.3)	
Age when the child starts using latrine (month)	24	120	37.04	34(28.3)	86(71.7)	$p = 0.047^*$ $r = -0.126$
	36	136	41.98	53(39)	83(61)	
	48	63	19.44	30(47.6)	33(52.4)	
	59	5	1.54	1(20)	4(80)	
Disposal of the child stool	Latrine	150	46.91	51(33.6)	101(66.4)	$\chi^2 = 4.117$ , $df = 2$ , $p = 0.128$
	Garbage	126	38.89	54(42.9)	72(57.1)	
	Other	48	14.20	13(28.3)	33(71.7)	
<b>Immunization practices</b>						
Immunization practices	Take the child for immunization	179	55.25	49(27.4)	130(72.6)	$\chi^2 = 15.489$ , $df = 2$ , $p < 0.001^*$ $r = -0.172$
	Take the child sometimes for immunization	95	29.32	27(54)	23(46)	
	Do not take the child for immunization	50	15.43	42(51.6)	53(48.4)	

df=Degree of freedom, HH=Household, N=Frequency, NA=Not applicable, PCG=Primary caregiver,  $\chi^2$  =Pearson Chi-square,  $r$ =Pearson's R, \*Statistically significant,  $p$ =P-value.

ces to food and water. The majority of the respondents took their child for immunization and knew the purpose of immunization, which is for disease prevention. The risk of diarrhoea among children under five years was found to be high among PCGs who did not take their child for immunization. This finding is similar with a study conducted in a rural slum in India where children who were partially immunized had higher risk of diarrhoea.<sup>13</sup>

### Limitations

One of the limitations of the study is insecurity within the field of the study. This prevented the researchers from free movement. In the study field, assaults are frequent. The limitation of this study in contrast to other studies is the fact that a focus group discussion did not take place so respondents were limited to answering the questionnaires.

### Conclusions

Several factors such as number of people in a household, number of children under five years in a household, relationship of the PCG, level of education, renting, presence of flies, presence of open garbage, presence of faeces, and immunization prac-

tices of the child were found to be associated with diarrhoea prevalence.

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