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Relationship Between Settlement Type And Caregivers' Risk Behaviours For Childhood Diarrhoea In Mwanza City, Tanzania

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Abstract: *Diarrhoea, an easily preventable disease, has remained a public health problem among children under-five years of age globally. Caregivers' risk behaviours for diarrhoea are well known. However, the relationship between settlement type and caregivers risk behaviors for diarrhoea is not clear. The overall objective of this study was to determine the relationship between settlement type and caregivers' behavioural risk factors for diarrhoea in children. A cross sectional study was conducted in Mwanza City from June to August 2016. Validated structured questionnaire for diarrhoea survey developed by United States Agency for International Development was employed for data collection. Principle component factor analysis was performed to reduce variables that had less weight before employing cross tabulation, bivariate and binary logistic regression. The results showed that settlement type has no association with caregivers risk behaviours for diarrhoea in children. Therefore, strategies of improving infrastructure in unplanned settlements for the purpose of reducing childhood diarrhoea should be accompanied with educating community on how to quit from diarrhoeal risk behaviours, because individual behaviour is not influenced by type of settlement where he resides.*

Key words: Settlement, type, caregivers, risk, behaviour, diarrhoea, Mwanza, Tanzania

1. Introduction

Diarrhoea is defined by the World Health Organization (WHO) as the passage of loose or liquid stool in 24 hours (WHO, 2017). It is the second leading cause of illness and death among children under-five years of age globally. While studies on prevalence of diarrhoea in developed countries show prevalence by specific cause, the overall prevalence of diarrhoea in developing nations is 14% (Pinzón-Rondón et al., 2015). Diarrhoea kills approximately 760,000 out of 1.7 billion cases occurring each year in children under-five years of age (WHO, 2017), and nealry 90% of all deaths occur in low and middle income countries (Ahs et al., 2010). Among children deaths due to diarrhoea, 78% occur in Africa and South East Asia (Farthing et al., 2013), and over 50% occur in only five countries which are India, Afghanistan, Pakistan, and Ethiopia (Rahman et al., 2014). In Tanzania, diarrhoea is the third cause of admission and fifth cause of deaths among children under-five years of age (NMR, 2013; URT, 2016).

The WHO (2014) and United Nations Development Program (UNDP, 2006) reports quoted by UN habitat associated living in unplanned settlements with increased risk of diarrhoea (UN Habitat, 2015a). Globally, nearly 1.8 million people die every year due to diarrhoea in unplanned settlements (UN Habitat, 2015a). In Ethiopia, the prevalence of diarrhoea is 40% and 10% in unplanned and planned settlements respectively (Bayene & Dessie, 2014). Diarrhoea is responsible for approximately 22% of death of children staying in Nairobi unplanned settlements (Kyobutungi, Ziraba, Ezeh, & Ye, 2008). In Dar-es-Salaam, acute diarrhoea (cholera), is a common health problem in unplanned settlement where the incidence of diarrhoea increase by one percent for every percentage increase in unplanned settlement (Penrose, Castor, Werema, & Ryan, 2010).

Earlier hospital based studies in Mwanza City where 70% of its population resides in unplanned mountainous settlements with slopes ranging between 25° to 75°, show higher prevalence above national average (Hokororo et al., 2014, Temu et al 2011). Furthermore, studies show

prevalence of diarrhoea ranging between 33 and 57% among children under-five years of age (Hokororo et al., 2014; Mazigo et al., 2011; Temu et al., 2011).

Despite studies associating unplanned settlement with higher prevalence of diarrhoea in children under-five years of age, little is known about the relationship between settlement type and caregivers behavioural risk factors for diarrhoea. Therefore, there is a need for conducting a population based study to determine the influence of settlement type on caregivers' behavioural risk factors for diarrhoea. This study intended to determine the relationship between settlement type and caregivers' behavioural risk factors for diarrhoea in children in Mwanza city, Tanzania.

2. Literature Review

United Nations (UN) habitat defines unplanned settlement as a settlement where residents have no security of tenure against the land or dwelling they inhabit (UN habitat, 2015). Urban unplanned settlements are occupied by 25% of the world population in different rates, and Africa region where 62% of its urban population lives in unplanned settlement is the most affected. Moreover, in Asia 30%, Latin America 24%, Western Europe over 6%, of their population occupy unplanned settlements. Furthermore, there is a significant number of people residing in unplanned settlement in other developed regions (UN habitat, 2015). In Tanzania as well as Mwanza City, 70% of urban population stays in unplanned settlements (URT, 2013a).

Different studies have associated unplanned settlement with higher prevalence of diarrhoea in children under-five years of age (Ezeh & Oyebode, 2016; Kattula et al., 2015; Khan et al., 2013; UN habitat, 2015; Unger, 2013). The prevalence of diarrhoea among children under-five years of age is reported to be eight times higher in unplanned settlement as compared to planned settlements (Bayene & Dessie, 2014), with 4.8 times higher chance of death due to diarrhoea (Unger, 2013). Unplanned settlement is also associated with higher risk of infectious diarrhoea (Ezeh & Oyebode, 2016), which leads to higher prevalence of diarrhoea in children under five years of age (Kattula et al., 2015; Khan et al., 2013). In developing countries, unplanned settlements are homes of marginalized people who lack basic sanitation and hygienic infrastructure like modern toilet, sewage system, improved sources of domestic water as well as health care services (UN habitat, 2015), increasing the chance for diarrhoea and deaths among children under five years of age.

Moreover, studies have associated caregivers' behaviour with diarrhoea in children (Freeman et al., 2014; Hashi, Kumie, & Gasana, 2016). Among caregivers behavioural risk factors associated with diarrhoea include using a pit latrine (Uwizeye et al., 2014), neglecting maintaining

cleanness of household surroundings (Oloruntoba, Folarin, & Ayebe, 2015), using any cup to take water from shared household domestic water container (Mamo & Hailu, 2014), leaving children under care of caregivers other than biological parents (Rashid & Abbas, 2012), parents' low level of education (Diouf et al., 2014), and separation of parents (Rashid & Abbas, 2012).

However, there is scarcity of published studies showing the relationship between settlement type and caregivers behavioural risk factors for diarrhoea among children under-five years of age. Therefore, this study aimed at determining the association between settlement type and caregivers behavioural risk factors for diarrhoea among children between 6 and 59 months of age in Mwanza city, Tanzania.

3. Methodology

The study was conducted in Mwanza City, in Tanzania from June to August, 2016. Mwanza City lies at altitude of 1,140 metres above sea level, with a temperature ranging between 15.4 to 30.2^{o} Centigrade (Mwanza City Council, 2008). It is the second largest City in Tanzania, and is geographically divided into two divisions namely Ilemela and Nyamagana with 21 wards (Mwanza City Council, 2008). The City has a total of 706, 453 people of whom 342,530 are males and 363,923 are females (NBS, 2013), living in 65,500 households (URT, 2013b). It also has a rural- urban migration rate of 8% (Mwanza City Council, 2008).

Mwanza City has an area of 1,324 square kilometres of which 900 (68%) is covered with water. It also has 18 unplanned settlements occupying 244 (57.5%) square kilometres of dry land (URT, 2013b). On the North, the City borders Lake Victoria and Ukerewe, Misungwi District to the South, Magu District to the East and Sengerema District in the West. The City had a total of 124,479 children under- five years in 2013 (NBS, 2013).

About 83% of Mwanza City population uses pit latrines and nearly 8% of households is connected to city sewer system (URT, 2014a). About 33% of households are connected to piped water, 85% of its solid water is collected (Lupala, 2014), and the city manages 100% of its liquid waste generated every day (Lupala, 2015).

The choice of Mwanza City was based on the fact that 57.5% of its dry land which is occupied by 70% of City residents (URT, 2011; URT, 2013a) is unplanned (URT, 2013b). Unplanned settlements of the City are characterised by rocky mountainous and low land settlements. The mountainous unplanned settlements of Mwanza have slopes ranging between 25° and 75° (Ndyuki, 1999). Secondly, the City has been one among the areas in Tanzania that experiences recurrent outbreaks of cholera (Thomas et al., 2013), despite being declared

the cleanest City in Tanzania for nine consecutive years (URT, 2014a). Thirdly, hospital based studies in Mwanza City have shown a high prevalence of diarrhoea in children under-five years age above the national average (Hokororo et al., 2014; Mazigo et al., 2011; Temu et al., 2011).

Based on this background, the present study was conducted at Butimba, Igoma, Isamilo, Kirumba, Nyamanoro, Mahina, Mkuyuni, Mbugani, Nyakato and Pasiansi wards of Mwanza City, Tanzania. The selection of these wards was based on the facts that they had both unplanned and planned settlements as well as sufficient population (58.3% of the city population).

3.1 Research Design
The study employed cross sectional research design which was chosen because firstly, it describes distribution of variables and examines association among variable in a population based sample (Brink & Wood, 1998). Secondly, the study involved collecting information on exposure and outcome at one point in time (Aschengrau & Seage, 2008).

3.2 Targeted Population
The targeted population was 80,945 children between 6 to 59 months of age residing within the Mwanza City (NBS, 2013). The age between 6 to 59 months was chosen because as infants start weaning at the age of six months, they start taking new things some of which are unsafe food and water, and get in contact with unsanitary surrounding. In this period, they start losing protective effects of their mothers' immunity and immunological benefit of breast milk. This increases their risk for suffering from diarrhoeal diseases. Only children between

6 to 59 months of age who stayed in the selected households for at least six months before the study, and whose caregivers' consented were included in the study. Despite children being between 6 and 59 months of age, and caregivers consenting for the study, serious ill children were excluded from the study.

3.3 Sampling Procedures
A sample size of 398 subjects was obtained by using the following formula proposed by Yamane, 1967.

$$n = \frac{N}{1 + N(e)^2}$$

Where n= Sample size
N=Population size (80,945)
e= the level of precision (0.05) (Yamane, 1967).

This is one of formulas commonly used in estimating a sample size in cross sectional studies. Eighty two participants were added to make a total sample of 480.

Eighteen out of 21 wards composing Mwanza City were listed because they had both planned and unplanned settlements. Thereafter, a simple random sampling method was employed in order to obtain ten wards out of 18. The simple random sampling method is a probability sampling technique whereby all members in the population have an equal chance of being selected to form a sample (Adam & Kamuzora, 2008). Then, proportion of population per ward was obtained to allow a fairly division of sampled subjects, 70% and 30% being from unplanned and planed settlement respectively (Table 1 and 2). In Mwanza City, 70% of population resides in unplanned settlement (URT, 2011).

Table 1: Distribution of Study Population by Wards (N=480)

Ward	Population	% (N=**469,951**)
Butimba	46,944	10
Igoma	56,596	12
Isamimilo	24,220	5
Kirumba	28,103	6
Kitangiri	51,456	11
Mahina	59,437	13
Mkuyuni	46,083	10
Mbugani	39,041	8
Nyakato	82,348	17
Pasiansi	35,723	8
Total	**469,951**	**100**

Source: NBS, 2013

Thereafter, the wards were stratified into unplanned and planned settlements, before employing the modified systematic sampling technique to select 70% and 30% of required participants from unplanned and planned settlements respectively. The modified systematic sampling technique is a method in which the targeted population is divided by estimated sample size to achieve

the sampling fraction, which is used as an interval between one participant and another ("Systematic Sampling", 2009). According to the nature of unplanned settlement and topographic features of Mwanza City (Figure 1), the modified systematic sampling method was presumed to be the best method for sampling the participants.

Table 1: Distribution of Study Population by Wards (N=480)

Ward	% of population	Study Population	Planned (70%)	Unplanned (30%)
Butimba	10	48	34	14
Igoma	12	58	41	17
Isamimilo	5	24	17	7
Kirumba	6	29	20	9
Kitangiri	11	53	37	16
Mahina	13	62	42	19
Mkuyuni	10	48	34	14
Mbugani	8	38	27	11
Nyakato	17	82	57	25
Pasiansi	8	38	27	11

Source: Field Data

Figure 1: Unplanned Settlement, Kirumba Ward in Mwanza City
Photo by Author on June, 2016

Guided by the sample fraction, the ten selected wards were visited and 480 households were selected. On arrival to the ward, nearby households were assigned numbers and the researcher picked randomly one number to get the first household. Thereafter, caregivers were interviewed until the required number of participants per ward was obtained. If the selected household had no eligible child, the next household was picked.

3. 4 Data Collection Procedures

The study employed standard structured questionnaires. Structure questionnaires, are questionnaires in which there are definite, concrete and predetermined questions (Kothari, 2013). Structured questionnaire was preferred to enable all respondents be asked exactly similar questions in the same order. A structured questionnaire for diarrhoea studies developed by United States Agency for International Development (USAID, 1999) was adapted for data collection. The questionnaire covered important information needed to determine relationship between type of settlement and caregivers' risk behaviour for childhood diarrhoea.

Five research assistants of whom three were secondary and primary school teachers,one was University student and one was medical laboratory technologist participated in data collection. They underwent a two days training before collecting data. In such training, questions and their meaning were elaborated. Instructions on how to introduce the study, enquire consent, ask questions and record the response as well as conclusion of the discussions were given.

The questionnaire was pre tested and necessary changes were made to meet the objective of the study. Participants in the pilot study were from the similar setting but did not participate in the main study. Thereafter, wards were visited and participants identified. On arrival, the purpose of the study was explained to caregivers to obtain their oral and written consent. Questionnaires were administered by the research assistants face to face to caregivers whom responded on behalf of their children. To prevent a recall bias, the questions requested the specific action within 14 days.

3.5 Variable Measurements

Independent variables were unplanned and planned settlements, and were evaluated by using the map of Mwanza City. Intermediate variable included 11 caregivers' behavioural risk factors, and was evaluated by asking caregivers questions related with behavioural risk factors for diarrhoea. The questionnaire required them to respond by saying "Yes" if they had a particular behaviour or "No" if they did not. Outcome variable was presence or absence of diarrhoea in children, and was evaluated by asking caregivers if the child involved in a study had suffered from diarrhoea in the past 14 days.

3.6 Data Processing and Analysis

Data was entered into a computer using Statistical Package for Social Science (SPSS) Version 21.0. Thereafter, data cleaning was done before employing principle component factor analysis to reduce data which had less weight. Initially, variables were dictomized

before employing the principle component factors analysis. Initial factor analysis focused on Eigen value of which Eigen value score "3" criteria, unrotated factorial solution, and regression method that excluded case list-wise was used to determine variables to be retained.

The first analysis included 11 variables [(i) The behaviours of caregiver washing hands always before preparing food in the past two weeks; (ii) washing hands with soap and water always before preparing food in the past two weeks, (iii) washing hands always before feeding her child in the past two weeks, and (iv) washing hands with soap and water always before feeding her child in the past two weeks were analysed. Other analysed behavioural risk factors were caregiver; (v) washing hands always after toilet in the past two weeks, (vi) washing hands with soap and water always after toilet in the past two weeks, and (vii) washing hands always after changing child's napkins. Moreover, behaviour of caregiver; (viii) washing hands with soap and water always after changing child's napkins in the past two weeks, (ix) washing hands of the child always before taking food in the past two weeks, (x) washing hands of the child with soap and water always before taking food in the past two weeks, and (xi) The behaviour of caregiver washing hands of the child with soap and water always after toilet in the past two weeks] were analysed.

Four variables that scored weight less than 0.3 [(i) The behaviour of caregiver; washing hands always before preparing food in the past two weeks (0.287), (ii) washing hands always after changing child's napkins (0.047) (iii) washing hands of the child with soap and water always before taking food in the past two weeks (-0.157), and (iv) The behaviour of caregiver washing hands of the child with soap and water always after toilet in the past two weeks (-0.036)] were removed from the list.

The second factor analysis involving seven remaining variables [(i) The behaviour of caregiver; washing hands with soap and water always before preparing food in the past two weeks, (i) washing hands always before feeding her child in the past two weeks, (iii) washing hands with soap and water always before feeding the child in the past two weeks, (iv) washing hands always after toilet in the past two week, (v) washing hands with soap and water always after toilet in the past two weeks, (vi) washing hands with soap and water always after changing child's napkins in the past two weeks, (vii) The behaviour of caregiver washing hands of the child always before taking food in the past two weeks] were analysed.

Three variables which scored less than 0.3 [(i) The behaviour of caregiver; washing hands always after toilet in the past two weeks (-0.297), (ii) washing hands with soap and water always after toilet in the past two weeks (-0.791), and (iii) Caregiver washing hands of the child

always before eating food in the past two weeks (0.173)] were removed from the list.

This was followed by the normality test and descriptive statistics of the caregivers' behaviours. Then, a component score covariance matrix was performed, and "1" was used during coding to represent high caregivers diarrhoea risk behaviours while "0" represented low caregivers diarrhoea risk behaviours.

Descriptive statistics of caregivers' behavioural risk factors for childhood diarrhoea showed a Shapiro & Wilk (1965) (p<0.001), and visual inspection of their histogram, normal Q-Q plot and box showed the test results score, were approximately not normally distributed between caregivers risk behaviours for childhood diarrhoea. Results showed -0.13674 as the mean of caregivers risk behaviour for diarrhoea, -0.2950 as the median, -1.519 as the minimum and 1.824 as maximum, 0.212 skewness, and -0.999 kurtosis. Using the median, subjects were stratified into low and high caregivers' risk for diarrhoea, and 305 (63.5%) caregivers had low risk behaviours against 175 (36.5%) caregivers whom had high risk behaviours. Thereafter, cross tabulation (Pearson chi square), bivariate, and binary logistic regression was performed, and p-value of 0.05 was used for statistical significance.

3.7 Ethical Considerations

The ethical clearance was obtained from the University of Dodoma. Permission to visit the community was obtained from Mwanza Regional Commissioner, Mwanza City Director and Ilemela District Commissioner's offices.

4. Results and Discussions

4.1 Results

Table 3 presents the relationship between the type of settlement and caregivers' behavioural risk factors for childhood diarrhoea (χ^2). Results have shown that, there was no significant relationship between type of settlement and caregivers' behavioural risk factors for diarrhoea in children between 6 to 59 months of age (P<0.870).

However, caregivers' behavioural risk factors which were found to be significantly related with childhood diarrhoea include the father's level of education (p<0.008), mother's level of education (p< 0.038), being biological parent (p<0.001), and parent staying together (p<0.001). Other factors which were found to be significantly related with caregivers' behavioural risk factors were the child age between; 48 to 59 months (p<0.009), 36 to 47 months (p< 0.002), 12 to 23 (p<0.015), 6 to 11 months of age (p< 0.003), using bottle, cup and spoon for feeding the child (p<0.001), and pit latrine (p< 0.001).

Table 3:Relationship between Settlement types and Caregivers' Behavioural Risk Factors for Childhood Diarrhoea in Mwanza City, in Tanzania (χ^2) (N= 480)

Variable	Category	Low Risk Behavior	%	High Risk Behavior	%	χ^2	P-Value
Diarroea in the past 14 days	Yes	59	19.3	39	22.3	0.59	0.442
	No	246	80.7	136	77.7		
Unplanned settlement	Yes	228	74.8	132	75.4	0.02	0.870
	No	77	25.2	43	24.6		
Rooms 3 or less	Yes	213	69.8	128	73.1	0.59	0.442
	No	93	30.2	47	26.9		
Clean surroundings	Yes	25	8.2	15	8.6	0.02	0.886
	No	280	91.8	160	91.4		
Spoon feeding	Yes	157	79.6	40	22.9	37.63	0.000
	No	40	20.4	135	77.1		
House ownership	Yes	175	57.4	92	52.6	1.04	0.308
	No	130	42.6	83	47.3		
Income ≤ 170,000 Tsh	Yes	136	44.6	72	41.1	0.53	0.463
	No	169	55.4	103	58.9		
Primary Ed. or less (father)	Yes	109	35.7	84	48	6.95	0.008
	No	196	64.3	91	52		
Primary Ed. or less (mother)	Yes	123	40.3	54	30.9	4.28	0.038
	No	182	59.7	121	69.1		
Biological parent	Yes	270	88.5	132	75.4	14.01	0.000
	No	35	11.5	43	24.6		
Parents staying together	Yes	256	84.6	121	69.1	15.97	0.000
	No	47	15.4	54	30.9		
Pit latrine	Yes	75	24.6	71	40.6	13.41	0.000
	No	230	68.9	104	59.4		
48-59months of age	Yes	46	15.1	37	21.1	2.85	0.009
	No	259	84.9	138	78.9		
36-47 months of age	Yes	39	12.8	42	24	9.96	0.002
	No	266	87.2	133	76		
24-35 months of age	Yes	57	18.9	40	22.9	1.19	0.274
	No	247	81.3	135	77.1		
12-23 months of age	Yes	84	27.5	31	17.7	5.89	0.015
	No	221	72.5	144	82.3		
6-11 months of age	Yes	79	25.9	25	14.3	8.84	0.003
	No	226	74.1	150	85.7		

Caregivers behavioural risk factors related with childhood diarrhoea were stratified into two groups being high and low caregivers' risk behaviour for childhood diarrhoea. Factors significantly related with a high caregivers' behavioural risk factors for childhood diarrhoea were primary or lower father's level of education (48%) against 35.7%, child age between; 48-59 (21.1%) against 15.1% and 36- 47 (24%) as compared to 12.8%, as well as using pit latrine (40.6%) as compared to 26.4%. Factors significantly related with low caregivers risk behaviour, for childhood diarrhoea include primary or lower the mother's level of education (40.3%) against 30.9%, being a biological parent (88.5%) against 75.4%, and parents staying together (84.6%) as compared to 69.1%. Furthermore, other factors found to be significantly related with a low caregivers' behavioural risk factors for childhood diarrhoea include the child age between; 12 - 23 months of age (27.5%) as compared to 17.7%, 6-11 months (25.9%) against 14.3% as well as spoon feeding (51.5%) against 22.9%.

Bivariate logistic regression results (Table 4) shows the type of settlement had no significant statistical association with caregivers' behavioural risk factors for childhood diarrhoea (p< 0.870). Factors significantly associated with the caregivers' behavioural risk factors for childhood diarrhoea were primary or lower; father's level of education (OR=1.669, CI: 1.138, 2.422), mothers' level of education (OR=0.660, CI: 0.445, 0.979), guardian type (OR=0.398, CI: 0.243, 0.651), and parents staying together (OR=0.408, CI: 0.261, 0.683).

Moreover, child's age group between; 36 to 47 months of age (OR=2.154, CI: 1, 329, 3.491), 12 to 23 months

(OR=0.566, CI: 0.357, 0.899), 6 to 11 months (OR= 0.477, CI: 0.291, 0.782), spoon feeding (OR=0.273, CI:0.184, 0.424), and pit latrine (OR=2.094, CI: 1.405, 3.119), were found to be significantly associated with caregivers' behavioural risk factors for childhood diarrhoea.

Table 4: Bivariate Logistic Regression of Relationship between Settlement type and Caregivers' Behavioural Risk Factors, for Childhood Diarrhoea in Mwanza City, Tanzania (N=480)

Variable	Category		OR	95 C.I for OR		P- value
				Lower	Upper	
Primary Ed. or less (father)	Yes		1.669	1.138	2.422	0.009
	No	ref				
Primary Ed. or less (mother	Yes		0.660	0.445	0.979	0.039
	No	Ref				
Biological parent	Yes		0.398	0.243	0.651	0.000
	No	Ref				
Parents staying together	Yes		0.408	0.261	0.638	0.000
	No	Ref				
Pit latrine	Yes		2.094	1.405	3.119	0.000
	No	Ref				
Spoon feeding	Yes		0.273	0.184	0.424	0.000
	No	Ref				
48-59 months of age	Yes		1.510	0.935	2.439	0.092
	No	Ref				
36-47 months of age	Yes		2.154	1.329	3.491	0.002
	No	Ref				
12-23 months of age	Yes		0.566	0.357	0.899	0.016
	No	Ref				
6-11 months of age	Yes		0.477	0.291	0.782	0.003
	No	Ref				
Unplanned settlement	Yes		1.037	0.674	1.594	0.870
	No	ref				

Source: Field data

Caregivers' behavioural risk factors for childhood diarrhoea, was higher 1.6 (OR=1.669, p<0.009) in children, whose fathers' level of education was primary school or less, up to 2.1 (OR= 2.154, p<0.002), among children between 36 to 47 months and 2 (OR= 2.094, p<0.001) in households using pit latrine. However, caregivers' behavioural risk factor was significantly low (OR= 0.660, p<0.039) in households, whose mother's level of education was primary school or less, biological parents (OR=0.398, p<0.001), parents staying together (OR=0.408, p<0.001), child's age between; 6 to 11 months (OR=0.477, p<0.003), 12 to 23 months (OR=0.566, p<0.016), and spoon feeding (OR= 0.273, p< 0.001).

Table 5: Binary Logistic Regression of Association between Settlement type and Caregivers' Behavioural Risk Factors for Diarrhoea in Mwanza City, Tanzania (N=480)

Variable	Category		AOR	95 C.I for OR		P- value
				Lower	Upper	
Primary Ed. or less (father)	Yes		1.451	0.926	1.272	0.104
	No	ref				
Primary Ed. or less (mother	Yes		0.638	0.389	1.046	0.075
	No	Ref				
Biological parent	Yes		0.318	0.151	0.771	0.003
	No	Ref				
Parents staying together	Yes		0.644	0.339	1.226	0.180
	No	Ref				
Child age 36-47 months	Yes		1.550	0.798	3.008	0.196
	No	Ref				
Child age 24-35 months	Yes		1.047	0.551	1.987	0.889
	No	Ref				
Child age 12-23 months	Yes		0.792	0.401	1.562	0.500
	No	Ref				
Child age 6-11 months	Yes		1.335	0.551	3.236	0.522
	No	Ref				
Pit latrine	Yes		3.244	1.492	3.683	0.000
	No	Ref				
Spoon feeding	Yes		0.251	0.132	0.476	0.000
	No	Ref				
Settlement type	Yes		1.052	0.651	1.700	0.837
	No	Ref				

Table 5 show results of the binary logistic regression analysis. After controlling for the confounders, factors which remained to be significant statistically associated with caregivers' behavioural risk factors for childhood diarrhoea include the guardian type (AOR=0.318, CI: 0.151, 0.771), household type of toilet (AOR= 3.244, CI: 1.492, 3.683), and child feeding mode (AOR=0.251, CI: 0.132, 0.476).

Having a pit latrine, increased more than 3 times the odd of caregivers' behavioural risk factors for diarrhoea (AOR=3.683, p<0.003) as compared to other types of toilets. Being biological parents, reduced the caregivers' behavioural risk factors for childhood diarrhoea irrespective of other factors (AOR= 0.318, p< 0.001). Bottle, cup and spoon feeding, reduced the odds of the caregivers' behavioural risk factors for childhood diarrhoea (AOR=0.251, p<0.001) as compared with hand feeding.

4. 2 Discussion

Results have shown that there was no association between settlement types and the caregivers' behavioural risk factors for childhood diarrhoea in Mwanza City. This may be due to a high rural-urban immigration rate in Mwanza City which exceeds the ability of the City to meet the demand of the social services including surveyed land, hence, people of all classes occupy un-surveyed land from indegenous people and expand unplanned settlements. This is in line with Mwanza City report which declares that the population growth is beyond its capacity of meeting the needs of population including providing enough residential surveyed land (Mwanza City Profile, 2008).

Univariate and bivariate analysis associated primary or lower fathers' level of education with higher behavioural risk factors for childhood diarrhoea in Mwanza City. This may be because had little knowledge on factors contributing to diarrhoea and methods of protecting their children from diarrhoea, therefore put little effort to protect them from diarrhoea. Higher risk of diarrhoea among children who had fathers' with lower level of education is in line with other studies which reported higher prevalence of diarrhoea in children whose fathers'level of education was low as compared to children with highly educated fathers (Agustina et al., 2013; Alaa et al., 2014).

Bivariate analysis showed that mothers' low level of education is associated with low caregivers' behavioural risk factors for childhood diarrhoea. However, this is contrary to other studies which reported higher caregivers risk behaviour for diarrhoea in children whose mothers had low level of eductation (Sarkar, 2016; Woldu, Bitew, & Gizaw, 2016). In the current study, This may be implying that mothers with low level of education in the

Mwanza City utilizes fully the knowledge they got at underfive children growth monitoring clinicsn on how to take care of their children and prevent them from the common childhood diseases including diarrhoea. In Tanzania, services providers at underfive growth monitoring clinics have a monthly community health education and promotion schedule for educating caregivers on how to prevent their children from common childhood diseases including diarrhoea.

Child age between 6 and 11 and between 12 and 23 months were associated with low caregivers' behavioural risk for diarrhoea, as compared to age between 36 and 47 months of age. This may be because, majority of biological mothers in Mwanza City were not employed, hence spent more time with young children than older ones who were able to play out doors with their friends. This is in line with a study which reported a low prevalence of diarrhoea among children who were under biological mothers' care as compared to caregivers other than biological mothers (Guarino et al., 2008).

Bivariate and binary logistic regression associated bottle, cup, and spoon feeding with low caregivers' behavioural risk factors for childhood diarrhoea. This is supported by study findings in Burundi, which reported a low prevalence of diarrhoea in children whose caregivers had enough knowledge on prevention of diarrhoea in children through sanitation and hygiene (Diouf et al., 2012). Low caregivers risk behaviours among caregivers who used bottle, spoon and cup for feeding children may be showing how caregivers in Mwanza City are well knowledgeable on the importance of clean eating utensils in prevention of diarrhoea in children therefore; maintain cleanness of bottle, cup and spoon to rescue their children from diarrhoeal diseases.

Bivariate and binary logistic regression analysis showed that being a biological parent was associated with low caregivers' behavioural risk factors for childhood diarrhoea. This is supported by findings in Nigeria, which reported two times lower chance of suffering from diarrhoea among children under parents' care (Raji et al., 2017). This may be because biological parents feel proud of taking care of their children, and put more effort in taking care of their children than caregivers other than biological parents.

Binary logistic regression analysis associated the use of pit latrine with high caregivers' behavioural risk for diarrhoea. This concurs with other study which associated higher prevalence of diarrhoea in children whose caregivers did not wash hands after toilet (Gebru et al., 2014). Higher caregivers risk behaviours for diarrhoea in households with pit latrines in the current study may firstly be because due to the nature of Mwanza City (rocky land), many pit latrines are shallow hence favours improper faecal disposal which easily contaminate sources

of water as well as domestic water. This is in line with a study done in Kigali Rwanda which associated shallow pit latrines with higher prevalence of diarrhoea in children (Uwizeye et al., 2014). Secondly, higher caregivers' risk behaviours for diarrhoea in households using pit latrines in the current study may be due to lack of post toilet washing hands facilities which hinder caregivers to wash hands after toilet. Inability to wash hands with soap and water after visting toilet increases the chance of faecal contamination of food and domestic water.

Univariate and bivariate analysis associated parents staying together with low behavioural risk for childhood diarrhoea in Mwanza City. This supports a study done in Nigeria which reported a two times lower chance of diarrhoea among children whose parents stayed together (Raji et al., 2017), as well as in Malawi, where children whose parents stayed together had better health than their counterparts (Carling & Tønnessen, 2013). In the current study, parents staying together may have increased the chance of getting basic needs like food and medical care, therefore, reduce the chances of diarrhoea in children as compared to a single parents.

5. Conclusions and Recommendations

The researchers have come up with the following conclusions derived from findings of this study:

- There is no relationship between settlement types and caregivers risk behaviours for diarrhoea in children
- Fathers' low level of education is associated with higher risk behaviours for diarrhoea among children
- Using pit latrine is associated with higher risk behaviours for diarrhoea
- Children taken care by biological parents have low chance of suffering from diarrhoea as compared to their counterparts
- Parents staying together is a protective measure against diarrhoea in children

From above conclusions, it is recommended that public health specialists should put more effort in educating the community on behaviours contributing to diarrhoea in children like neglecting washing hands before preparing food, before eating, after visiting toilet and changing child's napkins. They should also teach members of the community how to maintain higher environmental sanitation standards as the way of protecting their children from diarrhoea irrespective of settlements where they stay.

The ongoing national and international campaigns for supporting girls to attain higher level of education should not leave behind boys who are fathers for tomorrow as this is one among strategies for reducing diarrhoea in children. Moreover, men should be promoted to accompany their partners as they visit reproductive health clinics where they will get educated on how to protect their children

from diseases including diarrhoea. Religious leaders and other stakeholders should also promote stable marriage as one among methods of preventing their children from diarrheal diseases.

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