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Socio-Economic Determinants of Diarrhea Occurrence Among Children Under Five Years Old in Kenyan Slums: A Case Study of Korogocho, In Nairobi County, Kenya

Muriithi David Ikua

Abstract

According to the recent world estimates, children below the age of five years are in most cases at a very high risk of contracting diarrhea infections. The socio-economic characteristics of the caregivers and the households influences the kind of environment in which these children grow. The age of 5 years and below is characterized by socio economic aspects and environment of weaning, psychomotor skills of crawling and walking as well as picking and touching materials and surfaces that may be contaminated with diarrhea pathogens. This study was carried out to assess the socio-economic factors that are associated with diarrhea occurrence among children below five years in Korogocho slum located in Nairobi, Kenya. The study area was purposively sampled while the 90 respondents (mothers of children below five years) were randomly sampled from the entire slum composed of 12,909 households. Data on diarrhoea outcome and its determinants was based on two weeks recall and self-reporting survey while the socio-economic variables included size of household, marital status, levels of education and levels of income. Based on two weeks recall, 35.6% of the child mothers reported that their children had suffered diarrhoea related illness two weeks prior to the study against 64.4% who reported non-occurrence. The study established the dominant age brackets of respondents (49%) were between 29-38 years of age. In regard to marital status, out of the 90 respondents, 72 of them were married (80%) while 18 were not married (20%). In regard to the size of household and the occurrence of childhood diarrhea, majority of the respondents came from households that had 3-4 members (81.1%). In regard to the education level of mothers, majority of mothers reported to have undergone secondary school and above (72.2%). The

Chi square analysis for this variable { $\chi^2 = 16.728$ }, revealed that there was significant relationship between levels of education of the mother and the occurrence of diarrhoea of children below five years. The main source of income for the respondents was salaried, casual employment and small-scale businesses. 69% of respondents reported that the household in which they came from earned less than Ksh 5,000 per month while the rest 31% reported to have an income of more than Ksh 5,000 per month. The study recommends that the Government and other stake holders should ensure that the residents of informal settlements have adequate access to quality and affordable education and reliable sources of livelihoods

Keywords: Diarrhoea occurrence, Child care takers, Demographic factors, Socio-economic factors,

Chi-square (χ^2)

Introduction

Background of the Study

Around 1.1 billion people globally do not have access to improved water supply sources whereas 2.4 billion people do not have access to any type of improved sanitation facility. About 2 million people die every year due to diarrhoeal diseases most of them children less than five years of age. The most affected are the population in developing countries living in extreme conditions of poverty, normally the peri urban dwellers. Among the main problems which are responsible for the situation are; lack of sustainability of water supply and

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sanitation services, poor hygiene behaviours and inadequate sanitation in public places. Providing access to sufficient quantities of safe water, the provision of facilities for sanitary disposal of excreta and creating awareness on sound hygiene behaviours are of capital importance to reduce the burden of disease caused by the risk factors (WHO, 2012). Diarrhoea among children below five years is one of the leading causes of childhood mortality in developing countries. In Kenya it is the third highest cause of death after malaria and tuberculosis among children below five years (Ziraba et al 2012). Despite diarrhoea being a disease that is easy to prevent and treat in Kenya, it continues to be a major burden of disease to the Kenyan economy where close to 100 children die every day from diarrhoeal diseases (UNICEF 2013). The mortality due to diarrhoea disease is worse in slums which are characterized by poor hygiene and poor sanitation.

Statement of the problem

The under five years old children morbidity due to diarrhoea disease is worse in Nairobi which is characterized by poor hygiene and sanitation due to its many informal settlements (31%). Statistics from the Kenyatta National hospital show that on a given day paediatricians attend to between 10 and 20 cases of diarrhoea in children below five years (Kariuki P.N 2010). The numbers also show that 3 to 5 of these cases are severe and are therefore referred for admission. Majority of these cases come from the Nairobi informal settlements, Korogocho being among the leading slums. The high prevalence of diarrhoeal disease is largely attributable to by poor sewerage disposal, contaminated water and poor hygiene at house hold level.

In Korogocho, the fourth largest slum in Nairobi after Kibera, Mukuru and Mathare, more than 12,000 households have little or no access to clean water supply and effective sanitation infrastructure. It is estimated that 95% of Korogocho residents have no access to good sanitation and only 19% of livelihoods have access to piped water (APHRC, 2012). The health of the under five years children is negatively affected by inadequate water and sanitation and the rate of diarrhoea among these children in Korogocho is more than double that of Nairobi as a whole (Well, 2005). The major contributors of diarrhoea of under five years have been found to be contaminated drinking water and food, lack of proper toilet facilities, ineffective disposal of household wastes, lack of hand washing practice after visiting toilets and before handling foods as well as low education levels especially among mothers of under five years children. Data collected by APHRC (2012) on establishing causes of childhood death over a ten-year period (2003-2011) showed that 8.34% of all deaths recorded in Korogocho were linked to diarrhoeal disease. There has been a significant but consistent decline of diarrhoea related deaths in the last 10 years ranging from 12.7% in 2003 to 10.6% in 2011 with the lowest drop to 4.6% in 2008.

Literature Review

Studies conducted in developing countries have focused on socio-economic and environmental variables that affect the incidence of diarrhoea, particularly housing conditions, parental education, and income (UNICEF 2005). A study from the Republic of Congo and south west Ethiopia revealed that children coming from households that obtained water from protected sources like treated tap water were less likely to have diarrhoea as compared to those

who got their water supply from unprotected sources like open wells (Teklemariam S, et al 2003). Hygiene and literacy may be closely related. Although the evidence is inconclusive, some studies conducted primarily in Africa especially in Ethiopia, republic of Congo, and Kenya have shown that diarrhoea rates are highest in families with the lowest levels of educational attainment. This is because families with basic education levels are aware of some of the factors that may cause diarrhoea and knowledge on management of the disease (Boerma and Ginneken, 1996). Diarrhoea morbidity of under five years children in the rainy season as compared with the other seasons is usually higher (KWAHO, 2008 and Roy, A.2011). This is because of running surface water which becomes contaminated by poorly disposed human waste. This water collects into collection points and sometimes consumed without treating it. A study done by Woldemichael G. (2001) also examined the effect of some environmental and socio-economic factors that determine childhood diarrhoea in Eritrea. He used data from the 1995 Eritrea Demographic and Health Survey (EDHS). The results showed that type of floor material, household economic status and place of residence are significant predictors of diarrhoea. This is because a cemented floor is easy to wash as compared to non-cemented floor which is full of dust and highly contaminated with germs. Economic status in this sense referred to the income levels that affects place of residence, feeding habits, waste disposal and knowledge about treatment of water and under five years diarrhoea.

Even though progress towards MDG target represents important gains in access for quality water supply for billions of people worldwide, it has been uneven. This is because inaccessibility persists due to sharp geographic, socio cultural and economic inequalities. In Nairobi, 94% of slum residents were found buying domestic water from the vendors and paid about 8 times more for it than their non-slum counterparts. In addition, water supply was irregular and vendors were found to charge increased prices indiscriminately. Hygiene was also compromised during periods of water shortage (Kimani, et al., 2005).

Theoretical framework

Woldemichael G (2001) examines the effect of some environmental and socioeconomic factors that determine childhood diarrhoea in Eritrea. He uses data from the 1995 Eritrea Demographic and Health Survey (EDHS). The method employed was logistic regression and the results showed that type of floor material, household economic status and place of residence are significant predictors of diarrhoea. Other than the socio-economic factors affecting diarrhoea investigated in the above studies, the study also attempted to discover an important relationship between diarrhoea morbidity using the logistic regression model and household environmental factors in an urban settlement with particularly high prevalence of diarrhoea in a poor urban setting like Korogocho slum. A comparative study of urban areas of Ghana, Egypt, Brazil and Thailand by Timaeus and Lush (1995) clearly indicates that children's health is affected by environmental conditions and economic status of the household. According to these authors, children from better-off households have lower diarrhoea morbidity and mortality in Egypt, Thailand, and Brazil. Such differentials in diarrhoea diseases by household economic status are probably due to differences in child care practices, for instance preparation of weaning

foods and personal hygiene (Timaeus and Lush, 1995). Despite this comparative study having dealt with major environmental conditions likely to influence occurrence of diarrhoea, it did not consider the accessibility and availability to toilet facilities as a major predictor of diarrhoea in children below five years. The current study therefore intends to fill such gaps.

Jacoby and Wang (2003) examined the linkages between child mortality and morbidity, and the quality of the household and community environment in rural and urban China using a competing risks approach. The key findings include; (1) access to safe water or sanitation reduces child mortality risks by about 34% in rural areas; (2) higher maternal education levels reduce child mortality and female education has strong health implication i.e. controlling for other factors influencing diarrhoea occurrence, (a child living in a neighborhood with more educated mothers has about 50% lower mortality risk); (3) access to safe water/sanitation, and immunization reduce diarrhoea incidence in rural areas, while access to modern sanitation facilities (flush toilets) reduces diarrhoea prevalence in urban areas. This study strives to indicate that effective policy interventions for improving health outcomes often lie both within and outside the health sector.

Environmental and socio-economic conditions in Kenyan slums and Diarrhoea occurrence in children under five years

Slums in cities of most developing countries are characterized by poor infrastructure facilities such as solid waste disposal, sewage disposal, and drainage which lead to environmental degradation and in absence of sufficient number of community toilets, these people are forced to excrete in the open (Bhardway, 2007). The accumulation of garbage in four informal settlements in Nairobi city, namely Kawangware, Korogocho, Viwandani and Njiru was found to be a consequence of lack of dumping sites in the communities and the inability of the city council to collect the garbage for appropriate dumping (Amuyunzu and Taffa, 2004). This study was done in Nairobi with an aim of assessing the trend of poverty, environmental and

child health in Nairobi informal settlements. The authors reported that the uncollected garbage often accumulate and block drainage and the poor drainage in the informal settlements contaminates drinking water through broken pipes which may increase chances of children of under five years contaminating diarrhoea pathogens. Likewise, members of slum settlements in Nairobi city used sewerage water, rain water and water from broken pipes for various purposes such as drinking, washing etc. (Amuyunzu and Taffa, 2004).

In another study done by Kimani et al. (2007) on health and livelihood implication of the marginalization of slum dwellers in the provision of water and sanitation services in Nairobi city, 31% reported that informal settlements in Nairobi continues to be characterized by poor living conditions, including lack of affordable house, clean water, inadequate toilet facilities, poor garbage disposal and drainage mechanisms. The slum dwellers of Korogocho in particular lack basic environmental facilities such as sanitation, drinking water supply, electricity etc. (Owuor et al, 2009).

Materials and Methods

Study design

The research design that was adopted in this study was survey design which involved sampling three out of nine villages based on demographic and socio-cultural factors and randomly selecting the households in each pre-determined village to collect data from mothers of children aged five years and below (Muriithi DI., 2014).

Target population and sampling procedure

The target population in this study was women with children aged five years or less in a household. The total number of households in Korogocho was 12,909 and the sample population was drawn from the three sub locations of Korogocho and one village in each sub location. The households where a woman had more than one child aged five years or below was treated the same with households where a woman had only one child below five years although diarrhea.

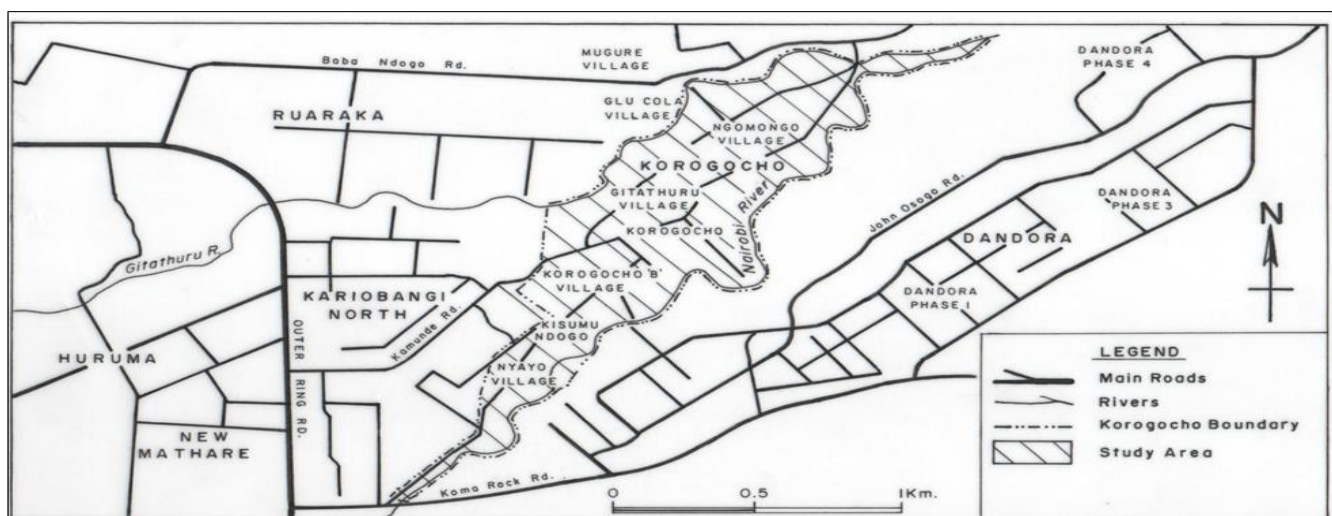


Fig. 1: Map of Korogocho showing the three selected villages for the study.

Data collection procedure

Primary data for this study was collected through administration of questionnaires to the respondents. A semi-structured questionnaire was orally administered to mothers of children aged less than five years to facilitate

proper understanding of the questions to give responses that were not biased. The questionnaire contained items linked to the variables of the study as indicated in the study questions. These variables were: source of drinking water, treatment of drinking water, access to toilet facilities,

cleanliness of toilet facilities, level of mother’s education and hand washing by mothers during critical times. The researcher also made observations of the community and household environment to reinforce data collected through questionnaires.

Data Processing and Analysis

Descriptive statistics of percentages and frequency tables were calculated for each variable in relation to the occurrence of diarrhoea in children below five years. Data was then subjected to further analysis using chi square statistics techniques. The Chi square technique was used to test the relationship between the dependent variable and the independent variables. The qualitative variables like occurrence of diarrhoea in children under five years was operationalised by setting frequencies of respondents who reported diarrhoea occurrence and those who reported non-occurrence. Both responses were coded differently in the SPSS software to perform a quantitative analysis test using chi square statistic.

The chi square results were presented in the format of chi square values (χ^2), degrees of freedom (*d*) and statistical significance test (*p*). The chi square value and the degrees of freedom were used to decide the probability or *p*-value of independence. When the computed χ^2 statistic exceeded the critical value in the table for 0.05 probability level, the null hypothesis of equal distribution was rejected.

Likewise, when the computed χ^2 statistic fell below the predetermined alpha level of significance (0.05), the null hypothesis of equal distribution failed to be rejected. Two major assumptions were made; one was that the data set was large enough to use chi square test. In cases where the sample size was small i.e. more than 20% of the contingency cells having expected values <5, a general description was made. Secondly the independence assumption was made i.e. data was not interrelated but rather categorical and independent from each other.

Results

Diarrhoea prevalence in children below five years in Korogocho 2 weeks prior the study

A total of 90 respondents (mothers of children below five years) which was 100% response rate participated in the study. All the respondents came from household with a child below the age of five years. Based on two weeks

recall, 35.6% of the child mothers reported that their children had suffered diarrhoea related illness two weeks prior to the study against 64.4% who reported non-occurrence. The prevalence was higher than earlier estimated (31%) by Mutunga (2004) and APHRC (2006) though the difference was small. This difference could have been contributed by different methodologies of data collection, recall period and difference in times at which the study was carried out. Majority of the children suffered one diarrhoea episode in the last two weeks before the study. The high prevalence could have been attributed by many factors such as lack of adequate water and dirty environmental conditions, poor children excreta disposal, contaminated latrines, poor garbage disposal, ineffective hand washing and lack of proper education and awareness on how to prevent occurrence of childhood diarrhoea.

Demographic characteristics of the respondents

The study established the dominant age brackets of respondents (49%) were between 29-38 years of age. This was followed by those in the age bracket of 39- 48 years comprised 20.2%, and 18-28 years comprising of 19.1%,while those in the age bracket of between 49-57 years were 11.7%. In regard to marital status, out of the 90 respondents, 72 of them were married (80%) while 18 were not married (20%). However, 12 respondents (13.3%) who reported that they were married had lost their husbands and therefore they were widows. In regard to the size of household and the occurrence of childhood diarrhea, majority of the respondents came from households that had 3-4 members (81.1%). Likewise, these households also recorded the highest number of reported cases of diarrhea occurrence among children below five years (81.25%)

Socio-economic characteristics of households

The study assessed two socio-economic characteristics of households and respondents. These were education levels of mothers of children below five years and level of income in a household.

Education levels of mothers of children below five years

In regard to the education level of mothers, majority of mothers reported to have undergone secondary school and above (72.2%). 27.8% of mothers reported to have attained a minimum of primary education while none reported not to have education at all. The figure 4.2 below shows distribution of level of education among the respondents in this study.

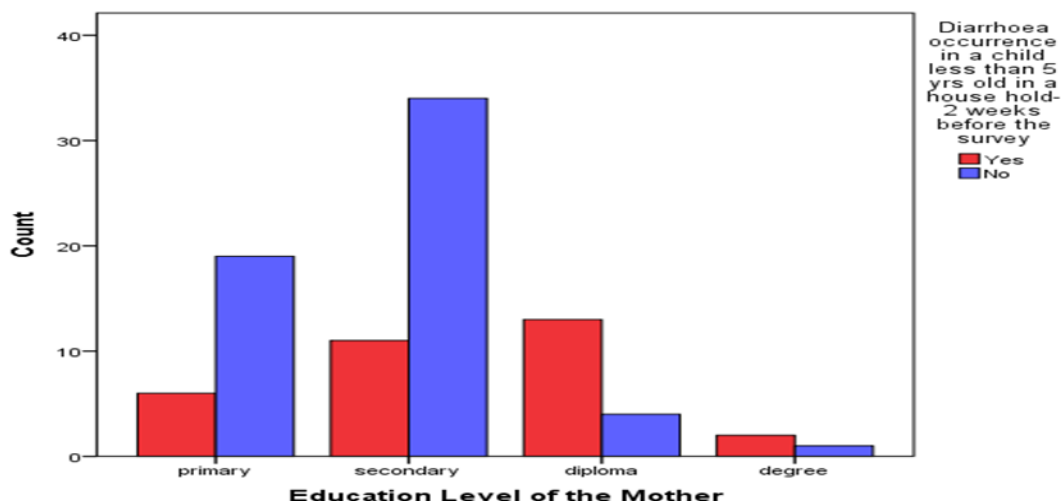


Fig. 2: Education levels of the mother and occurrence of childhood diarrhoea.

Establishing the relationship between level of education of the mother and occurrence of diarrhoea in children <5yrs

Level of education of the mother was classified into four categories: respondents with none meaning those who never went to school at all, Primary level which included those who at least attended primary education, secondary

level, Diploma and Degree. Data for Diploma and Degree levels were combined to form post-secondary levels. No one reported to have no education at all and therefore this level was excluded in analysis. Since all the cells had values more than five, chi square test was used to analyse data. Data for these variables were put in a contingency table as shown in the table below

Table 1: Contingency table for education level of mothers and occurrence of childhood diarrhoea.

Education Level of the Mother and Diarrhoea occurrence in children < 5 years in a house hold-2 weeks before the survey -Cross tabulation for chi square test				
Education Level of the Mother		Diarrhoea occurrence in a child (0-60 Months) in a house hold-2 weeks before the survey		Total
		Yes	No	
Primary	Observed Count	6	19	25
	Expected Count	8.9	16.1	25.0
Secondary	Observed Count	11	34	45
	Expected Count	16.0	29.0	45.0
Post-secondary education	Observed Count	15	5	20
	Expected Count	7.1	12.9	20.0
Total	Observed Count	32	58	90
	Expected Count	32.0	58.0	90.0

$\chi^2 = 16.728$ $d=3$ $p=0.05$ Critical value = (7.81)

The Chi square analysis for this variable { $\chi^2 = 16.728$ }, revealed that there was significant relationship between levels of education of the mother and the occurrence of diarrhoea of children below five years. $p < 0.05$ means that an increase in education did not cause a significant reduction in diarrhoea below five years. This could further be interpreted as education alone could not reduce diarrhoea prevalence among children below five years as other factors compounded its occurrence. The null hypothesis that there was no significant relationship between the level of education of the mother and occurrence of diarrhoea in children below five years was rejected.

Level of income in a household and occurrence of diarrhoea in children <5yrs

Level of income in a house hold was measured by asking the respondents the main source of income in the house hold and the Monthly income the household get from various sources. The income was categorized in bracket as shown in the table below. The main source of income for the respondents was salaried, casual employment and small-scale businesses. 69% of respondents reported that the household in which they came from earned less than Ksh 5,000 per month while the rest 31% reported to have an income of more than Ksh 5,000 per month. With the high cost of living such as rent expenditure, food expenditure, water shortage, lack of toilets and health expenditure, it was evident that the low levels of income affected the resident’s livelihood and therefore health of children below five years.

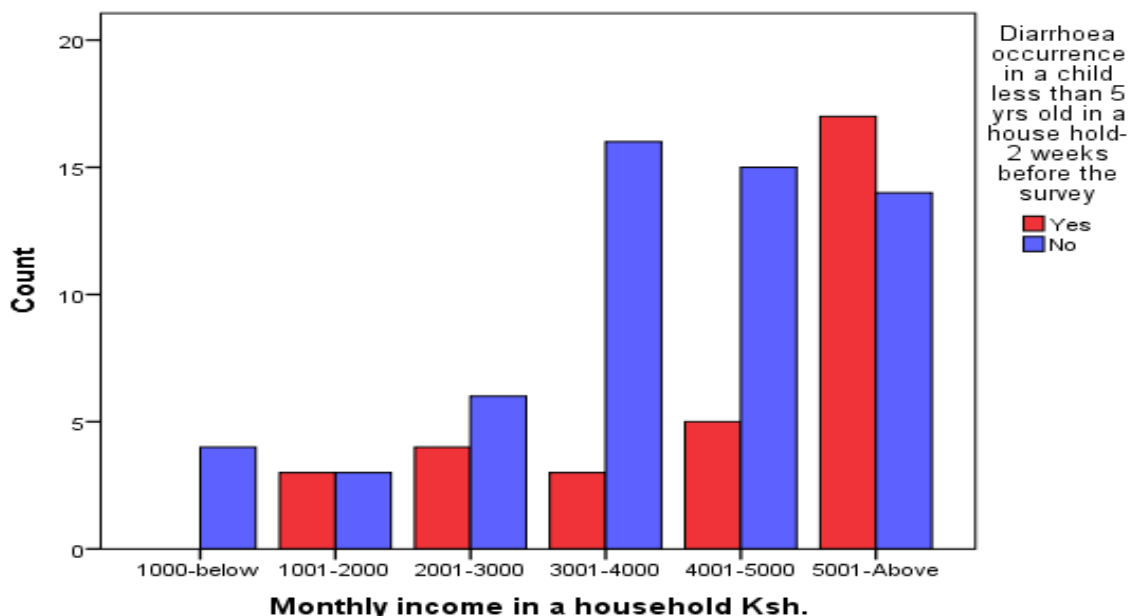


Fig. 2: Income levels and diarrhoea occurrence in children under five years old.

The study indicated that low household income did not increase the chances of children getting diarrhoeal disease, however a significant relationship was noted between the level of income in a household and the occurrence of diarrhoea in children below five years. This could be explicated by the fact that those earning low income are less likely to afford fee charged on water and pay toilets or to purify drinking water thus being at risk of diarrhoea. The findings concurred with those of Muthee Veroniah (1999), Grimason A (2000) and Ahmed (1992) who also indicated that household socio economic status is associated with child's survival because it determines the number of resources such as food, good sanitation and health care given to children.

The Chi square analysis for these variables { $\chi^2 = 8.370$ }, revealed that levels of income by mothers of children below five years was found to have a significant relationship to reject the null hypothesis that it was not significantly associated with diarrhoea occurrence of children below five years. This relationship could be interpreted that mothers had higher income were less likely to experience diarrhoea infections unlike those mothers who had less income. These tests were statistically significant at ($p < 0.05$) meaning that their results were not affected by any chance of random sampling.

Discussion of findings on Socio-economic factors associated with diarrhoea occurrence in children under five years

Children health is particularly dependent on the care giver and mostly the mother because she deals with the child most of the times. The poor understanding of transmission of diarrhoea infections and prevention among mothers increases the risks of exposure to infections among children. Childhood morbidity did not decrease significantly with higher education of child mothers though hygiene habit of the mother would be influenced by the level of education. This relationship was illustrated by a significant relationship between the level of education of the mother and the occurrence of diarrhoea in their children below five years of ($p < 0.05$). This could further be interpreted as education alone could not reduce diarrhoea prevalence among children below five years as other factors compounded its occurrence. It was likely that with little earnings that the household got, they were not able to purchase optimum amount of water to maintain proper hygiene and also to purify drinking water. Similar associations have been reported from Zimbabwe (Matovu, G. 2000,) although this was not true for Malawi and Zambia (Grimason A, 2000) which indicated that hygiene habits of the care givers can prevent exposure to diarrhoea. Mother's knowledge allows them to recognize symptoms and use health services more effectively than their less educated counterparts. Knowledge about the causes of diarrhoea disease is also vital as this directly or indirectly influences the mother's care to the child. This study established that 18.9% of children suffered diarrhoea from mothers who had Diploma education and above.

The study further indicated that low household income increases chances of children getting diarrhoea ($p < 0.05$). This could be explained by the fact that those earning low incomes are less likely to afford fee charged on water and sanitation or to purify drinking water thus more at risk. These findings concurred with those of Ahmed, 1992 and

K'oyugi, in 2007 who also indicated that household socio economic status is associated with child's survival because it determines the number of resources such as food, good sanitation and health care that are available to children.

In regard to socio-economic factors, mother's education also plays a role in the survival rate for children under five years of age. Educated care takers especially mothers allow them to recognize symptoms and use health services more effectively than their less educated counterparts. Knowledge about the causes of diarrhoea disease is also vital as this directly or indirectly influences the care given to the child. Diarrhoea of children under five years was particularly dependent on mothers understanding of transmission of diarrhoea infections among children. This can result in delayed referral to clinics or hospitals thus necessitating hospitalization when diarrhoea becomes severe. Childhood diarrhoea did not decrease significantly with higher education levels though a significant relationship was noted and thus this null hypothesis was rejected. However, hygiene habits like washing of hands after visiting toilet of mothers would be influenced by the level of education in which case this test was statistically significant at $p > 0.05$

It was noted that with the little earnings that the household got could not allow them to buy optimum amount of water to maintain proper hygiene and also to purify water. The study further indicated that low house hold income increase the chances of children getting diarrhoea attack. This could be explicated by the fact that those earning low income are less likely to afford fee charged on water and sanitation or to purify drinking water thus more at risk. These findings concurred with those of Ahmed, 1992 and Grimason A (2000) who also indicated that, house hold socio economic status is associated with child's survival because it determines the number of resources (such as food, good sanitation and health care) that are available to children.

Conclusion

Based on the findings, the following measures of managing diarrhoea were evaluated; With regard to education levels of mothers, though the association with diarrhoea was negative there is need to increase access in education for a girl child. This is because a significant relationship was found between level of education of the mother and hand washing during critical times. Knowledge about initial management of diarrhoea at home is critical before the child is taken to the hospital since diarrhoea causes rapid dehydration which could lead to child death. Well educated child mothers are able to recognize symptoms and seek healthy services more effectively than their less educated counterparts. This study concludes that diarrhoea infections in children under five years have significant impact on families of these children. The incidence of diarrhoea causes an increase in poverty as a result of increased cost of medication. In Korogocho, the indicators for water and sanitation conditions in the home and community environment depicted shortage and exposed children to pathogens and pollutant risks. The lack of convenient and affordable access to water has left residents to buy water from the vendors or walk long distances to public supply sources. According to secondary sources of data, the cost incurred in purchasing, storing or purifying water was higher for households with low-income earnings hence reducing the food budget which affects health particularly

for the vulnerable children.

Secondary data revealed that living in overcrowded conditions is significant factor leading to childhood diarrhoea illness in Korogocho slum. Overcrowded conditions are mainly because of the cost of housing and large family sizes. The findings from similar studies that sought to investigate the relationship between demographic factors and diarrhoea morbidity among the under five years indicates that diarrhoea morbidity was significantly higher among households with large size of family members (four people or more). This study established that the socio-economic factors or variables also contribute to childhood diarrhoea morbidity in the slum which is characterized by multitude of problems including poverty among residents. Household income is low and the rate of unemployment is rampant with many of residents depending on casual jobs. With low-income earnings, the resources including food, good sanitation and health care especially for children under five years are inadequate. The Government and other stake holders should ensure that the residents of informal settlements have adequate access to quality and affordable education and reliable sources of livelihoods. This will enable them acquire affordable health services, nutritious food, ability to purchase clean water and soaps and knowledge on treatment and prevention of diarrhea cases among the children under five years.

Competing Interests

Authors have declared that no competing interests exist.

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Authors' Contributions

This work was carried out by author who conducted the study, executed the statistical analysis and composed the draft of the manuscript.

Abbreviations

APHRC: African Population and Health Research Centre; DHS: Demographic and Healthy Surveys; EDHS: Ethiopia Demographic and Healthy Surveys; KPHC: Kenya Population and Housing Census; KNBS: Kenya National Bureau of Statistics; KWAHO: Kibera Water and Environmental Sanitation Programme; MDG: Millennium Development Goals; MOPHS: Ministry of Public Health & Sanitation; SPSS: Statistical Package for the Social Sciences ; UNDP: United Nations Development Programme; UNEP: United Nations Environmental Programme; UNFPA: United Nations Population Fund; UNICEF: United Nation Children Funds; WHO: World Health Organization

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Availability of data and materials

The data used in this article is part of the primary data extracted from the author's Thesis (2014) submitted to the University of Nairobi for partial fulfilment of the requirement of for the Degree of Master of Arts in Environmental Planning and Management in the Department of Geography, Population and Environmental Studies.

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