Original article

Socio-Demographic Determinants of Diarrhoeal Diseases among Under Five Years Old Children in Rwanda

Sylvestre Gasurira[1*], Emmanuel Bikorimana[1], Charité Niyitegeka[2], Theogene Nyandwi[3]

[1]*School of Nursing and Midwifery, University of Rwanda, College of Medicine and Health Sciences, Kigali, Rwanda*

[2]*School of Public Health, University of Rwanda, College of Medicine and Health Sciences, Kigali, Rwanda*

[3]School of Allied Health Science, *University of Rwanda, College of Medicine and Health Sciences, Kigali, Rwanda*

***Corresponding author:** Sylvestre Gasurira. School of Nursing and Midwifery, College of Medicine and Health Sciences, University of Rwanda, Rwamagana, Rwanda. Email: gassylvestre@gmail.com

Abstract

Background
Diarrhoeal disease is a worldwide public health issue and remains a major cause of mortality and morbidity in children under five years old. Low and middle income countries (LMIC) of Africa and part of Asia are more affected by diarrhoeal diseases.

Objectives
To measure the prevalence of Diarrhoeal Diseases and to assess Socio-demographic determinants among Under Five Years Old Children in Rwanda.

Methods
A cross-sectional design was used. Secondary data analysis was carried out on a sample of 7474 drawn from Rwanda Demographic and Health Survey (RDHS). RDHS used multistage sampling technique.

Results
After running multiple logistic regression, Sociodemographic determinants associated with diarrhoeal included age of children, wealth index category, mother education, husband/partner education, types of place of residence (P-Value<0.05).

Conclusion
The results of the study showed that diarrhoeal remains an important health issue in Rwanda. Occurrence of diarrhoeal was statistically associated with child age, wealth index, education of parents, types of place of residence.

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Background

Diarrhoeal diseases have been a major public health concern. Each year, an estimated 2.5 billion cases of diarrhoea occur among children under the age of five. According to World Health Organization (WHO), diarrhoeal is among the top ten killers worldwide and causes 11% of child deaths.[1] The report of United Nations International Children's Emergency Fund (UNICEF) showed that diarrhoeal mortality rate in children under five years old was 9% in 2015.[2] Africa,[3] and South Asia,[4] account for over half the cases of diarrhoeal deaths.

Studies conducted in the East Africa region showed that diarrhoeal is a big concern. The prevalence of diarrhoeal diseases in Tanzania was estimated at 11.6% to 15.8%,[5] and children aged between 12 to 23 months are mostly vulnerable. In Burundi the results showed that 32.6% of diarrhoeal cases were reported among children under 5 years old. [6] In Uganda, the study revealed that 32% to 48% of children under 5 years has been affected by diarrhoeal in the two weeks prior to Uganda Demographic and Health Survey. [7] According to Rwanda Demographic and Health Survey (DHS), the prevalence of diarrhoeal diseases among Children under 5 years in Rwanda was 12%.[8] In a period of 2009 to 2013, around 13,153 to 17,254 children were hospitalized because of non-bloody diarrhoeal in Rwanda.[9]

Consequences of diarrheic diseases on childhood development are many, including morbidity and death. Diarrhoeal affects the nutritional status of children through different mechanisms ranging from poor nutrients intake, poor nutrients absorption, and forced micronutrients excretion.[10] Poor absorption of nutrients lead to malnutrition which adds to childhood low immunity and this makes the child more prone to complex infectious diseases and inhibits the natural childhood growth and Hospitalization for diarrhoea can cause a significant burden to health systems and households.[11] Researchers believe that around 90% of diarrheic diseases among children under five result from inadequate sanitation and poor hygiene.[12] Consequently, to address the root causes of the diarrhoeal problem there is a need to understand the environmental and behavioral issues that result in diarrheic diseases.

Studies conducted in Rwanda showed that biological-socioeconomic and environmental factors that might offer a negative environment factors to biological cause's development.[13-14] The chain can be broken through successful hand washing and the adequate use of toilettes. However, the results from hand washing and hygiene cannot happen when people do not have access to safe water and adequate sanitation.[15]

Currently, Rwanda is attempting to address all the potential risk factors in order to stop the diarrhoeal diseases among children under five years old. The Ministry of health has

been working hard to control diarrheic diseases among children under five years and policies have been implemented. For example, the Ministry of Health, through a process of task shifting principles, have enabled Community Health Workers (CHWs) to play a pivotal role in identifying cases in early stages, treat them or refer them to health facilities before it becomes late. [16] Additionally, the same Ministry initiated further preventive measures by establishing new diarrhoeal vaccines.[13] Researchers found that Rotavirus accounts for more than a third of diarrhoeal deaths in children younger than 5 years worldwide, with more than half of these deaths happening in sub-Saharan Africa,[17] and the Government of Rwanda has introduced pentavalent rotavirus vaccine to prevent diarrhoeal burden in the country. Despite these efforts, diarrhoeal diseases continue to be among the top ten leading causes of mortality and morbidity for children under 5 years in Rwanda.[18] Therefore, the study will fill an important gap in what is known about diarrhoeal diseases in Rwanda. This study aims to identify Sociodemographic determinants associated with diarrhoeal diseases among under-five years' children in Rwanda.

Methods

Design

A secondary data analysis of data collected from a national population-based cross-sectional study design was carried out on data drawn from Rwanda Demographic and Health Survey (DHS, 2014-2015).

Participants' recruitment

The sampling frame used for the 2014-15 RDHS was the 2012 Rwanda Population and Housing Census (RPHC). A sample size of 7474 children under 5 years living in selected households constituted a sample size of the study. RDHS used multistage sampling technique. The first stage involved selecting sample points (clusters) consisting of enumeration areas (EAs) delineated for the 2012 Rwanda Population and Housing Census (RPHC). A total of 492 clusters were selected, 113 in urban areas and 379 in rural areas. The second stage involved systematic sampling of households. A household listing operation was undertaken in all of the selected EAs from July 7 to September 6, 2014, and households to be included in the survey were randomly selected from these lists. Twenty-six households were selected from each sample point, for a total sample size of 12,792 households.

Measures

Semi structured interview was used to collect data. Three questionnaires were used: household, women and men questionnaires. The household questionnaire collected information on children socio-demographic characteristics including Age of children in years, Gender, Households size, Wealth index category, Respondent currently working, Mother education, Husband/partner education, Religion of mother, Types of place of residence, Relationship to household

head were used as independent variables. The dependent variable in this study was ever had diarrhoeal or not. The questionnaires were translated from English into Kinyarwanda.

Data collection

In RDHS, the interview was done by trained research assistants using standardized World Health Organization instrument. Data collection for the 2014-15 RDHS was carried out by 17 field teams from November 9, 2014, to April 8, 2015. Each team was provided a vehicle with a driver. All questionnaires were transferred to the National Institute of Statistics of Rwanda (NISR) office every 3-4 days by 10 supervisors from the NISR and Rwanda Biomedical Center (RBC) who also coordinated and supervised fieldwork activities. ICF International provided technical assistance during the entire five months of data collection period. The numbers of questionnaires were verified by two receptionists.

Data analysis

Secondary data analysis of 2014-15 RDHS dataset was done using SPSS version 20.0. Univariate analysis was done for each variable (Table1). Bivariate analysis was carried out to assess the association between independent variables and dependent variable (Table 2). Socio-demographic variables which showed significant association (P-value <0.05) in Bivariate analysis were recruited in multivariate analysis to study their effect on diarrhoea (Table3). Odds ratio with 95% confidence interval was computed. A P-value less than 0.05 was considered statistically significant.

Ethical considerations

Approval for the right to use the databases of RDHS was obtained via online registration. All RDHS data are treated anonymously and confidentially, and the user is prohibited to make an effort to identify any household or individual respondent interviewed in the survey. Other researchers are not allowed to use the data set from RDHS without the written consent of RDHS. After doing a second data analysis, the researcher is required to submit a copy of any report or publication to the RDHS website.

Results

Socio-Demographic information of Children Age <5 years

Socio-Demographic information of Children aged <5 years are presented in Table 1. The majority (56.8%) of children is between 25-59 months. Overhalf (50.4%) are male. Regarding Household size a large number was between 1 to 5 members (60.5%). The majority (23.8%) was poorest, a large number (85.5%) were not working, the results showed that (71.6%) of them completed primary school. The majority of husband/partner (70%) completed primary school. The findings showed that a large number (48.6%) was protestant. Of them, the majority (78.1%) reported that it resides in rural area. When asked the relationship to household head, a large number (73.2%) reported being wife.

Table 1. Socio-Demographic information of Children Age <5 years

Socio- Demographic information	N (%)
Age of children in years	
Less than six months	702(9.4)
Six to 24 months	2529(33.8)
25-59 months	4243(56.8)
Gender	
Male	3766(50.4)
Female	3708 (49.6)
Households size	
1-5 members	4525(60.5)
More than 5 members	2949(39.5)
Wealth index category	
Poorest	1780(23.8)
Poorer	1565(20.9)
Middle	1421(19.0)
Richer	1277(17.1)
Richest	1431(19.2)
Mothers currently working	
Yes	1087(14.5)
No	6387(85.5)
Mother education	
No education	1067(14.3)
Primary	5355(71.6)
Secondary	853(11.4)
Higher	199(2.7)
Husband/partner education	
No education	1134(16.6)
Primary	4778(70.0)
Secondary	619(9.1)
Higher	270(4.0)
Don't know	29(0.4)

Religion of mother	2683(35.9)
Catholic	3636(48.6)
Protestant	898(12.0)
Adventist	163(2.2)
Muslims	53(0.7)
Jehovah Witness	39(0.5)
No religion	2(0.02)
Other	
Types of place of residence	
Urban	1635(21.9)
Rural	5839(78.1)
Relationship to household head and children	
Head	1073(14.4)
Wife	5474(73.2)
Daughter	675(9.0)
Daughter in law	38(0.5)
Granddaughter	38(0.5)
Sister	43(0.6)
Other relative	65(0.9)
Adopted/foster child	12(0.2)
No related	56(0.7)

Association between diarrhoea and Socio-demographic information of children under five years old

Association between diarrhoea and Socio-Demographic information of children under five years old was done (Table 2). Age of children in years, wealth index category, mother education, husband/partner education, Relationship to household head and children were statistically significant (p-Value <0.05)

Table 2. Association between diarrhoea and Socio-Demographic information of children under five years old

Variables	Ever had diarrhoea		Chi-square	p-Value
	Yes n(%)	No n(%)		
Age of children in months			132.73	<0.001
<6	29(4.1%)	673(95.9%)		
6-24	564(22.3%)	1965(77.7%)		
25-59	289(6.8%)	3954(93.2%)		
Gender			2.009	0.156
Male	476(12.6%)	3290(87.4%)		
Female	429(11.6%)	3279(88.4%)		
House hold size (members)			0.006	0.937
1-5	549(12.1)	3976(87.9%)		
> 5	356(12.1)	2593(87.9)		
Wealth index category			50.911	<0.001
Poorest	271(15.2)	1509(84.8)		
Poorer	226(14.4)	1339(85.6)		
Middle	162(11.4)	1259(88.6)		
Richer	130(10.2)	1147(89.8)		
Richest	116(8.1)	1315(91.9)		
Mother education			23.452	<0.001
No education	145(13.6)	922(86.4)		
Primary	669(12.5)	4686(87.5)		
Secondary	86(10.1)	767(89.9)		
Higher	5(2.5)	194(97.5)		
Husband/partner education			33.188	<0.001
No education	154(13.6)	980(86.4)		
Primary	587(12.3)	4191(87.7)		
Secondary	49(7.9)	570(92.1)		
Higher	13(4.8)	257(95.2)		
Don't know	7(24.1)	22(75.9)		

Religion of mother			4.222	0.632
Catholic	325(12.1)	2358(87.9)		
Protestant	446(12.3)	3190(87.7)		
Adventist	98(10.9)	800(89.1)		
Muslims	21(12.9)	142(87.1)		
Jehovah witness	8(16.7)	40(83.3)		
No religion	7(17.9)	32(82.1)		
Other	0(0.0)	2(0.02)		
Types of place of residence			6.610	0.010
Urban	168(10.3)	1467(89.7)		
Rural	737(12.6)	5102(87.4)		
Relationship to household head and children			30.101	<0.001
Head	129(12.0)	944(88.0)		
Wife	622(11.4)	4852(88.6)		
Daughter	118(17.5)	557(82.5)		
Daughter in law	7(18.4)	31(81.6)		
Granddaughter	4(10.5)	34(89.5)		
Sister	4(9.3)	39(90.7)		
Other relative	14(21.5)	51(78.5)		
Adopted/foster child	0(0.0)	12(100.0)		
Not related	7(12.5)	49(87.5)		

Multivariate analysis of diarrhoea with socio demographic information

Multivariate Analysis of Diarrhoea with Socio-Demographic determinants was carried out (Table 3). The results showed that children who are between six to 24 months were two times more likely to have diarrhoea compared to those who are less than six months (OR=2.027,95%CI=1.476-2.783, P.value (<0.001). Children who are between 25 to 29 months were more than three times more likely to have diarrhoeal compared to those who are less than six months (OR=3.257,95%CI=2.549-4.148, P.value <0.001). The richer had a 54.7% reduction in the odd of having diarrhoeal compared to those who are poorest. (OR=0.453,95%CI=0.122-0.921,P.value <0.034). Richest had a 67.9% reduction in the odd of having diarrhoeal compared to those who are poorest. (OR=0.321, 95%CI=0.021-0.783,P.value <0.044). Mothers who completed secondary school had a 37.9% reduction in the odd of having diarrhoeal compared to

those with no education (OR=0.621,95%CI=0.346-1.054, P.value <0.042). Mothers who completed higher education had a 46.7% reduction in the odd of having diarrhoeal compared to those with no education (OR=0.533,95%CI=0.211-0.987, P.value <0.012). Husbands who completed secondary school had a 47.9% reduction in the odd of having diarrhoeal compared to those with no education (OR=0.521,95%CI=0.146-0.954, P.value <0.021). Husbands who completed higher education had a 56.7% reduction in the odd of having diarrhoeal compared to those with no education. (OR=0.521,95%CI=0.112-0.781,P.value <0.022). Respondents who reported residing in rural area were more than two times more likely to report having diarrhoeal compared to those who reside in urban area (OR=2.344,95%CI=1.342-3.453,P.value <0.029).

Table 3. Multivariate Analysis of Diarrhoeal with Socio-Demographic Determinants

Variables	OR	CI 95%	P-value
Age of children in months			
Less than six months	1		
6 to 24 months	2.027	1.476-2.783	<0.001
25 to 59 months	3.251	2.549-4.148	<0.001
Wealth index category			
Poorest	1		
Poorer	1.289	0.985-1.610	0.208
Middle	1.243	0.769-2.007	0.374
Richer	0.453	0.122-0.921	0.034
Richest	0.321	0.021-0.783	0.044
Mother education			
No education	1		
Primary	1.121	0.654-1.567	0.321
Secondary	0.621	0.346-1.054	0.042
Higher	0.533	0.211-0.987	0.012
Husband/partner education			
No education	1		
Primary	1.241	0.987-1.767	0.678
Secondary	0.521	0.146-0.954	0.021
Higher	0.433	0.112-0.781	0.022

Types of place of residence			
Urban	1		
Rural	2.344	1.342-3.453	0.029
Relationship to household head and children			
Head	1		
Wife	0.921	0.674-1.983	0.098
Daughter	1.121	0.732-1.643	0.132
Daughter in law	0.921	0.634-1.544	0.432
Granddaughter	1.443	0.932-1.873	0.121
Sister	0.794	0.543-1.594	0.214
Other relative	1.432	0.854-1.732	0.132
Adopted/foster child	1.211	0.982-1.711	0.221
Not related	1.543	1.111-1.932	0.433

Discussion

The present study has the aim of identifying Socio-demographic determinants of diarrhoeal diseases among under five years old children in Rwanda. The findings showed that age of children, wealth index category, mother education, husband/partner education, types of place of residence were significantly associated with childhood diarrhoeal. The results of this study showed that children aged 6 months and above were at high risk of developing diarrhoea compared to children aged less than 6 months compared to other categories of age. These findings were in line with studies conducted in Southern Ethiopia,[20] India,[21] Sudan.[22] The high prevalence of diarrhoeal at this age could be due to the introduction of unhygienic weaning foods, and crawling starts at this age and the risk of ingesting contaminated foods and drinks is high. The current study found that the odd of diarrhoeal diseases of children decreases with the level of education of parents. The results are similar to the results of the study conducted in Somalia,[20] Northeast Ethiopia.[21] The explanation is that education can increase family health status and hygiene practices. Education can increase awareness about the transmission and prevention methods of diarrhoea. It also encourages changes in behavior family level. Types of residence was reported as a socio-demographic factor associated with diarrhoea. Children from rural areas are more exposed because the accessibility to safe water and sanitation is limited. This information is consistent with the results of the study conducted in Ethiopia.[22]

The key findings show a significant association between the household wealth indexes (status) and diarrhoeal among children less than five years old. This might happen because the children under five years

from poor family have a greater risk of developing diarrhoeal compared with children from better-off families. Children under five years from poor family do not have access to safe water and adequate sanitation, along with the promotion of good hygiene practices (particularly hand washing with soap), can help prevent childhood diarrhoea. According to Rwandan context, to be the poorest is failure to own a house and can hardly afford human basic needs while the poorer families was defined as those who have a shelter of their own or are able to rent one but rarely get full time jobs.[7]

Limitation

The information about validity and reliability are not detailed in the RDHS 2014-2015 report. The study reported socio-demographic determinants associated with diarrhoeal; causative agents were not studied because they were not reported in DHS dataset 2014-2015.

Conclusion

The results of the study showed that diarrhoeal remains an important health issue in Rwanda. Occurrence of diarrhoeal was statistically associated with child age, wealth index, education of parents, types of place of residence. To overcome this issue various strategies should be designed and implemented Including organizing continuous training and regular refresher courses which facilitate mother to gain knowledge on mode of transmission and prevention measures of diarrheic diseases, encouraging mothers to wash their hands with water and soap, before feeding the child, after going to the toilet/latrine.

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Conflict of interest

All authors report no conflict of interest

Authors' Contribution

SG was responsible for the study conception, design, and data analysis as the principal Investigator and contributed with the guidance of writing a complete manuscript, EB, TN, CN contributed in searching literature to support the analysis and data discussion, contributed in reviewing comments, contributed to the drafting, proofreading as well as editing of the manuscript.

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