

Diarrhea Occurrence and Nutritional Status of Children Less than Five years Living in Poor Households Nyabihu District, Rwanda

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Abstract

Diarrhoeal diseases remain an important cause of mortality and morbidity among children, particularly in low- and middle-income countries including Rwanda. Therefore, this study is aimed to assess diarrhea occurrence and associated factors among children less than five years living in very poor households of Nyabihu district, Rwanda. The government of Rwanda will use the findings of this research to set new strategy to prevent diarrhea among children less than five years living in very poor households falling in Nyabihu district. A cross-sectional study with quantitative method was conducted in Nyabihu District. A structured questionnaire was used to collect on the study variables. The study targeted all children below the age of five from very poor households residing in Nyabihu district. All 1525 very poor households participated in the study. Data was entered and analyzed with SPSS version 22. Binary and multiple logistic regressions analysis was used to establish factors associated with diarrhea occurrence. Inference was made using a 95% confidence interval and a p-value <0.05. Diarrhea prevalence was high 35% among children under the age of five in Nyabihu district. The findings shows that the majority of children 852(55.9%) were stunted. All children who were stunted reported to had diarrhea two weeks prior to survey. Having family history of diarrhea was associated with diarrhea occurrence among children under the age of five in Nyabihu district [AoR=3.54; 95%CI: (2.445-5.127), p<0.001]. Male children were more likely to have diarrhea compared to female [AoR=1.44; 95%CI: (1.130-1.832), p=0.003]. Children that born with normal birth weight were less likely to have diarrhea compared to those with lower birth weight [AoR=0.37; 95%CI: (0.393-0.753), p=0.045]. There is need to increase support received by poor families in rural area.

Keywords: Diarrhea; Stunting; Nutritional Status; Children Less Than Two Years; Nyabihu District

Introduction

World Health Organization defines diarrhea as frequent passage of watery or liquid stools, usually more than 3 times/day [1]. Diarrhea is still the leading cause of death in under-five children worldwide including Rwanda. Globally close to 2 million children die from diarrhea every year while many millions more have their development disrupted and their health undermined by diarrhea related diseases [2].

Diarrheal disease affects human life both in developed and developing countries. Acute diarrhea is one of the main problems affecting children under- five in the world, reducing their wellbeing, and this leads to a considerable demand for health care services. Despite the fact that it affects both developed and developing countries, it is evident that there is a strong relationship between diarrhea, poverty and unhygienic environmental conditions [3].

According to statistics by World Health Organization [4], children under three years of age in developing countries experience on average about three episodes of diarrhea every year. As a result, diarrhea is a major cause of malnutrition, and the most severe threat posed

by diarrhea is dehydration. Death can follow severe dehydration if the lost body fluids and electrolytes are not replenished. A significant proportion of diarrhea can be prevented through safe drinking water, good sanitation and hygiene.

Risk factors for diarrhea among children include age, sex, geographic location, drinking from unprotected water supply and household economic status. While poor sanitation, limited access to potable water, inappropriate breast feeding practices contribute to the burden of the disease, there continues to be the need to further document the socio-demographic correlates of diarrhea in order to inform policy and programmatic interventions that have potential to stem the prevalence of the disease [5].

Persons living in developing countries with poor access to safe water, sanitation, or hygiene infrastructure have increased risk of exposure to viral, bacterial and parasitic pathogens that can cause diarrheal diseases [6]. Inappropriate child feeding practices has also a major public health problem resulting in series of social and economic consequences especially in developing countries [7].

Malnutrition and diarrhea morbidity is a public health problem amongst children under five years of age in developing countries with the outcome usually being poor health, stunted growth, mental retardation and micro nutrient deficiencies. Children are one of the major vulnerable groups to diseases and malnutrition. Those under five years of age are especially more vulnerable because they are at a stage of rapid growth and development and their immune system is not fully developed to fight infections [8].

Diarrhea is the main cause of malnutrition [1]. Each episode of diarrhea deprives nutrients for normal growth, especially in under-five children due to the decrease of food intake and the absorption of nutrients as well as higher nutritional requirements during diarrhea [9]. Meanwhile, the malnourished children are said to have more severe, prolonged, and frequent episodes of diarrhea, making diarrhea and malnutrition a vicious circle [1].

The most recent Rwanda Demographic and Health Survey [10] reveals 8% of children under-age of five years remain with weight-for-age two or more standard deviations below the mean of the reference population, while 33% of children under 5 remain stunted, and continuing nutritional deficits are evidenced by anemia rates of 19% and 37% for women of reproductive age and under-five children, respectively [11]. Nyabihu is the only district reported to have high malnutrition rate with 59% and 9.7% for stunting and underweight respectively while the named district is among those of the country with low poverty rate 47% compared to Nyamasheke district with 69% [12].

There is need to address the immediate causes of diarrhea morbidity and malnutrition among this group and also their underlying basic factors if developing nations are to achieve complete well-being and reach functional and productive capacity in the population. Coupled with the fact that limited studies have been done on the determinants of diarrhea morbidity and nutritional status among children less than five years living in poor households in Nyabihu district, it is important to undertake this study in order to identify areas that need intervention so as to decrease direct health care costs and improve the quality of life of people living in poor households. Therefore, this study sought to assess nutritional status and diarrhea occurrence among children less than five years living in households with low income.

Methods

Research design

A cross-sectional study has been employed using quantitative data collection approach. A structured questionnaire was used to collect quantitative data.

Study area and target population

The study was conducted in Nyabihu district. In addition, Nyabihu District occupy 532 km² in Western Province, has its capital in Mukamira, with 12 sectors: Bigogwe, Jenda, Jomba, Kabatwa, Karago, Kintobo, Mukamira, Muringa, Rambura, Rugera, Rurembo and Shyira.

The resident population of Nyabihu district is 330,000 of whom 157,000 are males and females 173,000.

Since the study targeted child caregivers as respondents the target population is 17,771 poor households in the area according to Rwanda poverty classification. The child caregiver is however anyone who were responsible for the child at the time of the study in that household and could have been the mother, father, house helper or any other person.

Sample size

A report from Nyabihu district showed that by January 2019 the district had 2753 families is living in poverty where they receive government support. Of these families, 1525 had child/children under the age of five, therefore this was considered as sample size for this study.

Sampling techniques

Multistage sampling method was used. In the first step one sector was selected using simple random sampling method and then four sectors neighboring to it were selected because of the transmissibility of diarrhea diseases. In the second stage, 4 villages from each sector were randomly selected. In the third stage, households were selected using systematic sampling method where a sampling interval was obtained after multistage sampling technique of five sectors as explained above. The code and list of households meeting the inclusion criteria was obtained from the sector administration. Households were distributed accordingly to proportionate the number of households in each sector.

Data collection instrument

The data was collected using a pretested semi-structured questionnaire which was in English and then got translated to Kinyarwanda. It was administered to the bigger study participants with the help of 3 trained research assistants and the principal investigator. It took approximately 25 minutes to administer the questionnaire. In this study, diarrhea occurrence was determined through by asking question if child suffered from malaria in the last week. The questionnaire was pretested by administering to ten study participants in Gakenke district and the tools were modified thereafter.

Data analysis procedures

Raw data from the questionnaire were entered into EPI data and transported into SPSS version 22 for analysis. Descriptive statistics were used to tabulate and describe the data. The strengths of the associations were determined with multiple logistic regressions. Inference was made using a 95% confidence interval and a p-value < 0.05.

Ethical consideration

Ethical approval to conduct the study was sought from Rwanda National Ethics committee, and approval to carry out the study was sought and obtained from Nyabihu district. All the information collected from study participants were kept confidential. It was used for research purposes. The questionnaire didn't bear their names but had number thus their identity was not revealed. The names of study participants were not used in any report of this study or in any publication or presentations.

The consent of the respondents was sought and obtained before the administration of the questionnaire. The participants were informed that their participation is voluntarily, and they could withdraw from the study at any time without giving any reason. The findings were treated with utmost confidentiality and it is for the purpose of this research only. The objective and result of the study were explained to the subjects of research participants. Then, the participants were informed that the procedure used will not pose any potential risk and their identities and personal particulars will be kept strictly confidential.

Results

Household characteristics

A total of 1525 households participated in the study. The questionnaire was responded by the representative of household who had a child under-five years.

Variable	Frequency	Percentage
Gender of caregiver		
Male	362	23.7
Female	1163	76.3
Age of caregiver		
18-35	818	53.6
36-49	371	24.3
50-64	211	13.8
65+	125	8.2
Marital status caregiver		
Single mother/father	60	3.9
Married	972	63.7
Cohabitation	269	17.6
Window/Divorced	224	14.7
Education level of caregiver		
No formal education	569	37.3
Primary education	837	54.9
Secondary education	119	7.8
Number people live in the household		
1-3	404	26.5
4-6	850	55.7
6+	271	17.5
Wealth Index Assets-Based		
Lowest	634	41.6
Middle	525	34.4
Highest	366	24.0
Source of drinking water		
Unimproved	298	19.5
Improved	1225	80.5
Single trip time to reach the water source		
30min or less	1196	78.4
Between 30min and one hour	305	20.0
One hour or more	24	1.6
Sanitary facility		
Unimproved	634	41.6
Improved	891	58.4
Sanitary disposal of child feces		
Unsanitary	648	42.5
Sanitary	877	57.5
Observed hand-washing station or mobile e.g Bassin		
Noting	119	7.8
Hand washing facility	1406	92.2
A household member experienced diarrhea in past two weeks		
No	1345	88.2
Yes	180	11.8

Table 1: Household and adult's respondent's characteristics.

The majority of study respondents 1163(76.3%) were female, aged 18-35 years (53.6%). The majority of respondents were married (63.7%), had only primary education (54.9%), have 4-6 people that live in the household (55.7%). Nearly a half of household that participated in the study 634(41.6%) were in lowest wealth index. The research observed the sanitary condition of the household and find that 1225(80.5%) had improved source of water, 1196 (78.5%) use 30min or less to reach the water source, 891(58.4%) had improved sanitary facility, 648(42.5%) had poor sanitary disposal of child feces, 119(7.8%) do not have hand washing station or mobile e.g Bassin and 180(11.8%) had a household member with history of diarrhea in the last two weeks prior to survey.

Child characteristics

A total of 780 (51.1%) of children who participated in the study were female, 242 (15.9%) were aged 19 - 24 months, 167 (11.0%) were aged 0 - 6 months at the time of the survey. The majority of children 1292 (84.7%) have had normal birth weight with > 2500 grams, 806 (52.9%) did not complete vaccination dose according to Rwanda vaccination calendar for under-five years children.

Variables	Frequency	Percentage
Sex of a child		
Male	745	48.9
Female	780	51.1
Child age in months		
0-6	167	11.0
7-12	267	17.5
13-18	234	15.3
19-24	242	15.9
25-29	93	6.1
30-35	93	6.1
36-41	100	6.6
42-47	98	6.4
48-53	120	7.9
54-60	111	7.3
Child's birth weight at birth (g)		
<2500 g (lower birth weight)	233	15.3
>2500 g (Normal birth weight)	1292	84.7
Complete dose of vaccines according to Rwandan vaccine calendar		
Yes	719	47.1
No	806	52.9

Table 2: Child characteristics.

Diarrhea occurrence among children less than five years living in very poor households

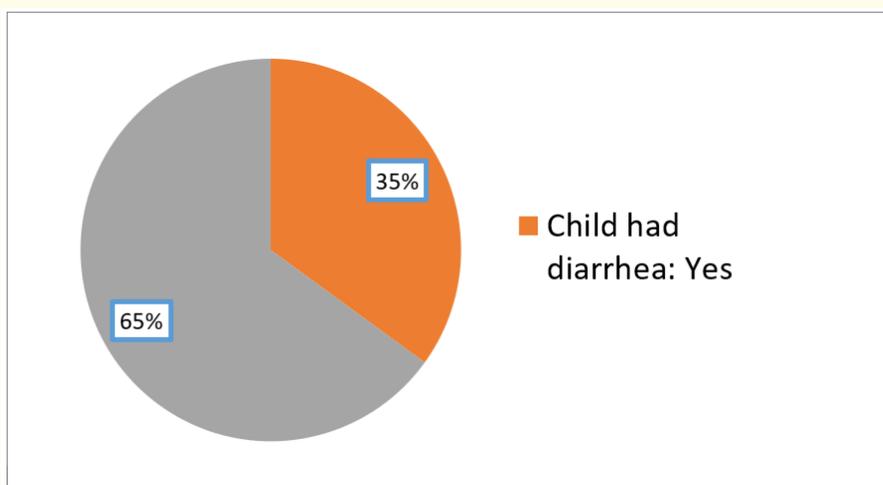


Figure 1: Diarrhea occurrence among children less than five years in Nyabihu District.

Out of 1525 households which participated in the study 534 (35%) reported to have had diarrhea within the last 2 weeks from the date of interview.

Variable	Frequency	Percentage
When the child had diarrhea, a child was given less than usual to eat (n=534)		
Much less	236	44.2
Somewhat less	83	15.5
About the same	89	16.7
More	5	0.9
Stopped food	101	18.9
Never gave food	20	3.5
Seeking treatment		
Yes	238	44.6
No	296	55.4
Place to seek treatment		
Government/private health facilities	120	50.4
Community health worker	86	36.1
Pharmacy	8	5.0
Traditional practitioner	20	8.4
Given treatment		
ORS	29	5.4
A pre-packaged ORS liquid	22	4.1
Homemade liquid	4	0.7
Zinc tablets or syrup	161	30.1
Traditional medicine	97	18.2
None	221	41.4

Table 3: Treatment seeking behavior.

Of 534 children who had diarrhea, 236 (44.2%) were given much less food than what they usually eat, 296 (55.4%) did not seek treatment of those who sought treatment 120 (50.4%) sought treatment in private health facilities, 221 (41.4%) did not seek treatment.

Nutritional status of children less than five years living in poor households

The findings show that the majority of children 852 (55.9%) were stunted.

	Frequency	Percentage
Stunted	852	55.9
Not stunted	673	44.1

Table 4: Nutritional status of under-five children.

Nutritional status of under-five years was also analyzed by age group to further understand which age group with higher prevalence of stunting.

Age group in Months	Stunting status	
	Yes n (%)	No n (%)
0-6	31(3.6)	136(20.2)
7-12	89(10.4)	178(26.4)
13-18	115(13.5)	119(17.7)
19-24	162(19.0)	80(11.9)
25-29	56(6.6)	37(5.5)
30-35	60(7.0)	33(4.9)
36-41	73(8.6)	27(4.0)
42-47	60(7.0)	38(5.6)
48-53	95(11.2)	25(3.7)
54-60	111(13.0)	0

Table 5: Children Nutritional status by age group.

The result shows that the prevalence of stunting was higher among children aged 19 - 24 months (19.0%) followed by those aged 54 - 60 months (13.0%). The lower prevalence was observed among children aged 0-6 months (3.6%).

Factors associated with diarrhea occurrence among children less than five years living in poor households

Variable	AoR	95%CI	P-value
Gender of caregiver			
Male	1.19	0.875-1.638	0.260
Female	Ref.		
Age of caregiver			
18-35	4.64	1.471-8.767	<0.001
36-49	3.98	2.145-7.405	<0.001
50-64	2.15	1.105-4.197	0.024
65+	Ref.		
Education level of caregiver			
No formal education	1.54	0.898-2.639	0.116
Primary education	1.50	0.927-2.452	0.098
Secondary education	Ref.		
Number people live in the household			
1-3	Ref.		
4-6	0.83	0.624-1.124	0.238
6+	1.01	0.699-1.488	0.920
Wealth Index Assets-Based			
Lowest	1.69	1.219-2.345	0.002
Middle	1.10	0.791-1.549	0.554
Highest	Ref.		
A household member experienced diarrhea in past two weeks			
No	Ref.		
Yes	3.54	2.445-5.127	<0.001

Sex of a child			
Male	1.44	1.130-1.832	0.003
Female	Ref.		
Child age in months			
0-6	0.24	0.011-0.052	<0.001
7-12	0.09	0.056-0.162	<0.001
13-18	0.13	0.077-0.221	<0.001
19-24	0.22	0.133-0.368	<0.001
25-29	0.28	0.152-0.520	<0.001
30-35	0.35	0.195-0.659	0.001
36-41	0.58	0.320-1.061	0.077
42-47	0.37	0.204-0.684	0.001
48-53	0.44	0.250-0.783	0.005
54-60	Ref.		
Child's birth weight at birth (g)			
<2500 g (lower birth weight)	Ref.		
>2500 g (Normal birth weight)	0.37	0.393-0.753	<0.001

Table 6: Multivariate analysis of factors associated with diarrhoea occurrence among under five years children.

The findings showed that the children with caregiver's aged 18-35 years old were most likely to have diarrhoea compared to those with caregivers aged 65 and above [AoR = 4.65; 95%CI: (2.471 - 8.767), $p < 0.001$]. Similarly, children with caregiver's aged 36 - 49 were 4 times more likely to have diarrhoea compared to those with caregivers aged 65+ [AoR = 3.98; 95% CI: (2.145 - 7.405), $p < 0.001$].

The findings shows that children born from lower wealth index families were 1.6 times more likely to have diarrhoea compared to those from higher wealth index families [AoR = 1.69; 95% CI: (1.219 - 2.345), $p = 0.002$]. Having family history of diarrhoea was associated with diarrhoea occurrence among children under the age of five in Nyabihu district [AoR = 3.54; 95% CI: (2.445 - 5.127), $p < 0.001$]. Male children were more likely to have diarrhoea compared to female [AoR = 1.44; 95% CI: (1.130 - 1.832), $p = 0.003$]. Very younger children were less likely to have diarrhoea compared to those with 54-60 months. The results shows that as the child grow the risk of having diarrhoea increased. Children that born with normal birth weight were less likely to have diarrhoea compared to those with lower birth weight [AoR = 0.37; 95% CI: (0.393 - 0.753), $p = 0.045$].

Discussion

Diarrheal disease is still a major public health problem worldwide. Globally, 525,000 children under-5 years die due to diarrhoea every year, roughly 2195 every day. This represents 8% of all deaths and is the second leading cause of death among children under-5 years old. Annually, 1.7 billion diarrhoea episodes occurred among children under-5 years worldwide. The majority of morbidity and mortality occurred in south Asia and sub-Saharan African countries, which 88% were attributable to unsafe water, inadequate sanitation, and insufficient hygiene [13].

The findings showed that 35% of children have had diarrhoea in past two weeks before the survey. This prevalence was higher compared to national prevalence of diarrhoea among children under the age of five. The 2020 Rwanda Demographic Health Survey showed that 14% of children under age 5 experienced diarrhoea in the 2 weeks preceding the survey [10]. This difference can be explained that this study was conducted among children from the very poor families with higher risk of having diarrhoea and poor health conditions.

The prevalence of diarrhea in Nyabubihu District was somehow higher than what reported in a study conducted by Habtu., *et al.* in Nyarugenge district where 26.7% of children under the age of five had diarrhea in the past two weeks prior to survey [14]. The inconsistency may be explained by the sample size, geographical location and targeted population. In the study conducted in Nyarugenge only 359 children participated in the study which is a small sample size compared to that 1525 in Nyabihu district. Additionally, the study was health facility based while this was a community based study, the urban area (Nyarugenge) vis Rural area (Nyabihu) might also affect the results. It was previously reported that children from rural communities were more likely to report diarrhea compared to children from urban areas [15].

This study found that prevalence of diarrhea in children under the age of five in Nyabihu district was 35%. This prevalence is slightly higher as compared to studies conducted in other countries. In Senegal diarrhea prevalence was 26% [16], 16.4% in Ethiopia [17]. This inconsistency in terms of diarrhea prevalence may be due to seasonal trends in diarrhea disease or difference in years and age of the study participants, geographical location as well as the differences in the study design, sample size, data collection and wealth status of the families.

The study found that children from younger caregivers, families with lowest wealth index, family member with history of diarrhea had higher risk of diarrhea. This study found that male children compared to female. This finding was supported by other study conducted in Ethiopia where boys were more than two times more likely to be affected by diarrhea than girls [18]. Similar finding was reported in the study conducted in Tanzania [19].

Children aged between 54 and 60 months were at high risk of developing diarrhea compared with children aged less than 54 months. This result was in line with the results of the study conducted in Northwest Ethiopia [20]. The increased risk might be due to the decline/loss in maternal antibodies and at this age child start eating at school that might increase their exposure to contaminated foods and water.

The researcher did not find an association between sanitary facilities, source of water with diarrhea occurrence among children under the age of 5. This finding is in line with a study conducted in Ghana [21] and in Senegal [22] where no association was found between sanitary facilities and the occurrence of diarrhea.

Conclusion

This study was conducted among caregiver and their under-five children from Nyabihu district. Diarrhea occurrence was high among under five children in Nyabihu district. High prevalence of stunting was observed among children that participated in the study. All stunted children have had diarrhea in the past two weeks before the survey. Young age for caregiver's, lowest wealth index, family history of diarrhea, gender and lower birth weight were factors associated with diarrhea among children under the age of five in Nyabihu District. There is a need to increase support received by poor families, to provide free health care services to children from very poor.

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