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Research Article

Prevalence and Factors Associated with Under Nutrition among Children Aged 6 to 59 Months in Ngoma District, Rwanda

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Abstract

In Rwanda, 38% of children aged 6-59 months are stunted. In Ngoma District, stunting rate is estimated at 41% among the children aged below 5 years. The study objective was to evaluate the prevalence and factors contributing to under nutrition among children aged 6- 59 months in Ngoma District. Cluster sampling was used to determine the study participants for each sector within 14 sectors by considering the sample size of 442. The WHO Anthro software version 3.2.2 was used to determine the nutritional status of the children. SPSS version 24 was used for analysis. Of 442 children participated in the study 50.9% of them were females, 24.4% were aged 15-23 months and the majority of children (89.8%) were born with normal birth weight. Study findings revealed that the prevalence of under nutrition was 33.7% for stunting, 3.6% for wasting and 6.6% underweighted. Poor sanitation facility (AOR: 4.1, 95%CI: 1.83-9.3, p=0.001), poor diet (AOR: 1.9, 95%CI: 1.18-3, p=0.008) were significantly associated with stunting. Factors such as lack of hand-washing facilities (AOR: 2.5, 95% CI: 1.013-6.3, p=0.047), not eat vegetables (AOR: 4.4, 95%CI: 1.7-10.96, p=0.001), and not eating fishes (AOR: 4.1, 95%CI: 1.6-10.6, p=0.003) were associated with wasting. Short breastfeeding duration (AOR: 4.5, 95%CI: 2.9-7.2, p=0.001), not eat vegetables (AOR: 1.9; 95%CI: 1.1-3.05, p=0.008), and not eat eggs (AOR: 2, 95%CI: 1.3-2.9, p=0.001) were associated with underweight. Poor families with under-five children need continuous support that will assist them to improve nutritional status of their children.

Keywords:
Under nutrition; Stunting; wasting; Underweight; Children aged 6-59 months; Ngoma district; Rwanda

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Introduction

Under nutrition was claimed to have negative impact on the public health in both developed and developing nations and has been related to the mortality and morbidity among children aged below five years. Though prevalence of under nutrition seems to be declining globally, nearly of 22.9% of children below 5 years still suffer from stunting while 7.7% of children below 5 years suffer from wasting [1].

Globally, at least 23% of children aged below 5 years are estimated to be stunted and 94% of these cases are found in Asia and Africa [2]. Furthermore, these estimates demonstrated that around 45% of deaths of children below 5 years are associated to under nutrition [2]. Stunting affected an estimated 21.3% of children below 5 and wasting affected an estimated of 6.9% of children below under 5 years. Majority of all stunted children under 5 years (54%) and most of all wasted children under 5 years (69%) lived in Asia, 40% of stunted children under 5 years and 24% of wasting children resided in Africa [3].

In Africa, prevalence of stunting among children aged under 5 years varies with region. The prevalence is above 30% in Central Africa and Eastern Africa, high in Western Africa and South Africa between 20 and 30%, medium in Northern Africa between 10 and 20% in Northern Africa [4]. In Rwanda the prevalence of undernutrition remains high. According to the Rwanda Demographic Health Survey (DHS) conducted in 2014-2015 children aged under 5 years, stunting rate was 38 %, wasting rate was 2% and underweight was 9% [5]. In Ngoma District where the study is focused, 41% were stunted, 16% had underweight and 4% were wasted [5]. The objective of this study was to determine the prevalence and factors associated with Under- Nutrition among childre under the age of five in Ngoma District.

Methods

Research Design

This research was a quantitative cross-sectional study. This research design is used in order to get information on the prevalence of undernutrition at the time of the study and to measure the magnitude of undernutrition. The researcher utilized structured questionnaire to collect the data and nutritional assessments of weight and height for the children aged between 6-59 months and to evaluate the factors associated with under nutrition among these children in Ngoma District, Eastern province, Rwanda.

Target Population

The population of interest was 38,006 children aged between 6 and 59 months [6], who lived within Ngoma district. Mothers or caregivers of the children were interviewed to capture the information for this research.

Sample Size

This research accounted for a sample of children in two strata (aged between 6-23 months and aged 24-59 months) paired with their mothers or caregivers in the period of one year (January-December 2020) who were obtained during monthly screening of undernutrition at community level. The sample size calculation was rooted on the prevalence of undernutrition revealed in DHS 2014-2015 where the prevalence of stunting was at 41 %, wasting at 4% and underweight at 16% in Ngoma District [5]. Formula for calculating a sample for proportions [7].

$n= Z^2 * PQ/e^2$ where n= sample size, P=Proportion of stunting (0.41), Q=1-P, Z=Level of confidence (1.96 used at 95% CI), e=Desired level of precision (5%), Design effect=1.2.

After formula's application $n= [(1.96)^2 * 0.41(1-0.41)/0.05^2] *1.2 = 442$

Data Collection Procedures and Tools

The researcher employed a self-developed questionnaire containing close-ended questions as a tool for data collection (Kumar, 2011). Data gathering was done in October 2020 during screening of undernutrition period. Anthropometric measurements were obtained after screened the children aged between 6 and 59 months.

Data Analysis Procedures

Data on age, height and weight were converted to z-scores of height or length-for-age (HAZ), weight for age (WAZ), weight for height or length (WHZ) using the World Health Organization Anthro software 3.2.2 to be able to determine the nutrition status. The World Health Organization standard reference (2010) was adopted to categorize children's nutritional status in stunting (HAZ < -2), underweight (WAZ < -2) and wasting (WHZ<-2). To check for association and to observe the frequency distribution of variables, SPSS version 24 was used to determine whether dependent variables (stunting, wasting and underweight) are associated with independent variables or not. Bivariate analysis and multiple logistic regression were used to control confounding variables by backward condition with removal at p value of 0.05 and 95% confidence interval.

Ethical Considerations

Ethical confirmation to conduct the research was acquired from Mount Kenya University Rwanda. In addition, permissions were obtained from local authorities and participating mothers before the study had been conducted. Participants were given adequate information on the purpose and benefit or harm that involvement in the research might bring. Participants were guaranteed privacy with respect to the data they provided and also their full right to choose not to engage or withdraw from the research without any consequence pertinent to their decision in this regard. Each participant was requested to offer oral consent and transcribed permission.

Results

Study results in Table 1 indicated that 50.9% of children were females, 24.4% were aged 15-23 months and the majority of children (89.8%) were born with normal birth weight. It was found that most of the mothers who participated in the study (71%) were married; (72.6%) had only primary education and more than half (58.8%) were living in poor socio-economic conditions.

Table 1. Demographic and socio-economic characteristics of the children and the mothers or caregivers

Variables	Frequency(n =442)	Percentage (%)
Child sex		
Male	217	49.1
Female	225	50.9

Table 1 (continued)

Variables	Frequency(n =442)	Percentage (%)
Age groups		
6-14	101	22.9
15-23	108	24.4
24-32	72	16.3
33-41	63	14.3
42-50	64	14.5
51-59	34	7.7
Weight of the child at delivery		
Less than 2,500 g	45	10.2
Above 2,500 g	397	89.8
Marital status of the mothers or caregivers		
Single	68	15.4
Married	314	71.0
Divorced	21	4.8
Widow	17	3.8
Separated	22	5.0
Education background of mothers or caregivers		
No educational	77	17.4
Primary school	321	72.6
Secondary school	24	5.4
University	7	1.6
TVET (Technical and Vocational Education and Training) School	13	2.9
Wealth index		
Category 1	125	28.3
Category 2	135	30.5
Category 3	152	34.4
Category 4	24	5.4
No category	6	1.4

Source: Primary data, 2021

As depicted in Table 2, the prevalence of stunting, wasting and underweight among the 442 children aged 6 to 59 months were at 33.7%, 3.6%, and 6.6%, respectively. The highest stunting rate (52.2%)

Table 2. Prevalence of undernutrition among children aged 6-59 months in Ngoma District

Variable	Length/height-for-age(Stunting)		Weight-for-length/height (Wasting)		Weight-for-age (Underweight)		Total
Age group	Severe stunting (%)	Moderate stunting (%)	Severe wasting (%)	Moderate Wasting (%)	Severe Underweight (%)	Moderate Underweight (%)	n
(6-11)	0	10.8	0	1.4	0	5.4	74
(12-23)	3.7	19.3	1.5	3	0	3	135
(24-35)	25.3	51.8	1.2	3.6	1.2	13.3	83
(36-47)	22.1	46.2	1	5.8	3.8	6.7	104
(48-59)	26.1	52.2	0	4.3	0	6.5	46
Total	13.8	33.7	0.9	3.6	1.1	6.6	442

Source: Primary data, 2021

was in children aged 48 to 59 months. The highest wasting rate (5.8%) was in children aged 36-47 months and the highest underweight rate (6.7%) was in children aged 36-47 months.

Regarding stunting as presented in Table 3, many factors have been found to be associated with it but the most significant with high risks were female children with 2.3 times more likely to have stunting than males (AOR: 2.3; 95%CI: 1.599 -3.434), children from families who did not have toilet were 4.1 times more likely to develop stunting than those from families with toilets (AOR: 4.1; 95%CI: 1.8-1.12), children who stopped breastfeeding early were 4.5 times more likely to be stunted than children who continued to breastfeed even above 2 years (AOR: 4.5; 95%CI: 2.9-7.2), children who did not eat vegetables were 1.9 times more likely to be stunted than children who ate it (AOR: 1.9; 95%CI: 1.18-3.05) while children who did not eat eggs were 2 times more likely to be stunted than those who ate it (AOR: 2:95%CI: 1.3-2.944).

Table 3. Distribution of children by predictors of stunting

Variables	Adjusted OR (AOR)	95%CI		p value
		Lower limit	Upper limit	
Child sex				
Male	Ref.			
Female	2.343	1.599	3.434	0.001
Marital status				
Single	0.432	0.252	0.739	0.02
Married	1.006	0.367	2.755	0.991
Divorced	1.135	0.375	3.438	0.823
Widowed	1.327	0.477	3.685	0.588
Separated	Ref.			

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Table 3 (continued)

Variables	Adjusted OR (AOR)	95%CI		p value
		Lower limit	Upper limit	
Education status of mothers or caregivers				
No educational	0.553	0.333	0.919	0.022
Primary school	0.319	0.122	0.837	0.02
Secondary school	0.319	0.122	0.837	0.02
University school	0.191	0.049	0.753	0.018
TVET School	Ref.			
Weight of the child at delivery				
Less than 2500 g	Ref.			
Above 2500 g	0.514	0.273	0.969	0.04
Treatment of water				
Boiled water	0.943	0.612	1.455	0.792
Filter water	1.823	1.123	2.959	0.015
No treatment of water	Ref.			
Sanitation facility				
Yes	Ref.			
No	4.131	1.833	9.312	0.001
Handwashing practices				
Yes	Ref.			
No	1.569	1.067	2.309	0.022
Malaria infection				
Yes	Ref.			
No	0.377	0.152	0.936	0.035
Diarrhea				
Yes	Ref.			
No	0.332	0.136	0.811	0.016
Milk support				
No	Ref.			
Yes	0.22	0.125	0.389	0.001
Ongera intungamubiri				
No	Ref.			

Table 3 (continued)

Variables	Adjusted OR (AOR)	95%CI		p value
		Lower limit	Upper limit	
Yes	0.237	0.159	0.353	0.001
Still breastfeeding				
Yes	Ref.			
No	4.599	2.913	7.26	0.001
Complementary breastfeeding				
Before six months	Ref.			
After six months	0.526	0.359	0.771	0.001
Eating vegetables				
Yes	Ref.			
No	1.9	1.181	3.057	0.008
Eating fruits				
Yes	Ref.			
No	1.695	1.153	2.492	0.007
Eating meat				
No	Ref.			
Yes	0.507	0.315	0.813	0.005
Eating fishes or small fishes				
Yes	Ref.			
No	1.651	1.105	2.467	0.014
Eating eggs				
Yes	Ref.			
No	2.012	1.374	2.944	0.001

Source: Primary data, 2021

Findings in Table 4 revealed that wasting was 5.8 times more among female children than male children (AOR: 5.8; 95%CI: 1.68-20.19), children who did not have the toilets in their families were 26 times more likely to develop wasting than those who owned it home (AOR: 26; 95%CI: 9.6-69.9), children who did not practice hand washing were 2.5 times more likely to develop wasting than children who used to wash their hands (AOR: 2.5; 95% CI: 1.013-6.3), children who started to breastfeed later were 2.6 times more likely to be wasted than the children who started to breastfeed within the first hour of life (AOR: 2.6; 95%CI: 1.03-6.7). Children who did not eat vegetables were 4.4 times more like to be wasted than the children who ate vegetables (AOR: 4.4; 95%CI: 1.7-10.96), children who did not eat fruits were 6.7 times more likely to be wasted than the children who ate fruits (AOR: 6.7; 95%CI: 2.2-20.5), children who did not eat beans were 10.9 times more likely to be wasted than the children who ate beans (AOR: 10.9; 95%CI: 4.2-27.9) while children who did not eat fishes or small fishes were 4.1 times more likely to be wasted than the children who ate it (AOR: 4.1; 95%CI: 1.6-10.6).

Table 4. Distribution of children by predictors of wasting

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
Child sex				
Male	Ref.			
Female	5.83	1.684	20.19	0.005
Marital status				
Single	0.121	0.038	0.384	0.001
Married	0.789	0.154	4.042	0.777
Widowed	1.184	0.285	4.917	0.816
Separated	Ref.			
Education status of mothers or caregivers				
No educational	0.103	0.037	0.285	0.001
Primary school	0.236	0.029	1.913	0.176
University school	0.451	0.054	3.802	0.464
TVET School	Ref.			
Weight of the child at delivery				
Less than 2500 gr	Ref.			
Above 2500 gr	0.09	0.035	0.232	0.001
Treatment of water				
Boiled water	1.74	0.482	6.282	0.398
Filter water	4.439	1.356	14.527	0.014
No treatment of water	Ref.			
Sanitation facility				
Yes	Ref.			
No	26.022	9.684	69.919	0.001
Handwashing				
Yes	Ref.			
No	2.532	1.013	6.329	0.047
Malaria				
Yes	Ref.			
No	0.024	0.008	0.069	0.001

Table 4 (continued)

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
Diarrhea				
Yes	Ref.			
No	0.021	0.007	0.061	0.001
Milk support				
Yes	Ref.			
No	0.185	0.074	0.463	0.001
Start to breastfeed the child				
Within the first hour	Ref.			
Later	2.647	1.035	6.77	0.042
Introduction of solid/semi solid foods				
Before six months	Ref.			
After six months	0.17	0.056	0.518	0.002
Eating vegetables				
Yes	Ref.			
No	4.41	1.775	10.96	0.001
Eating fruits				
Yes	Ref.			
No	6.752	2.218	20.554	0.001
Eating beans				
Yes	Ref.			
No	10.912	4.257	27.969	0.01
Eating meat				
No	Ref.			
Yes	1.912	1.309	2.792	0.001
Eating fishes or small fishes				
Yes	Ref.			
No	4.171	1.627	10.698	0.003
Age group of the child				
6-14	0.087	0.044	0.171	0.001
15-23	0.015	0.002	0.111	0.001

Table 4 (continued)

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
24-32	0.016	0.002	0.118	0.001
51-59	Ref.			

Source: Primary data, 2021

Table 5. Distribution of children by predictors of underweight

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
Child sex				
Male	Ref.			
Female	2.343	1.599	3.434	0.001
Marital status				
Single	0.432	0.252	0.739	0.02
Married	1.006	0.367	2.755	0.991
Divorced	1.135	0.375	3.438	0.823
Widowed	1.327	0.477	3.685	0.588
Separated	Ref.			
Education status of mothers or caregivers				
No educational	0.553	0.333	0.919	0.022
Primary school	0.319	0.122	0.837	0.02
Secondary school	0.319	0.122	0.837	0.02
University school	0.191	0.049	0.753	0.018
TVET School	Ref.			
Weight of the child at delivery				
Less than 2500 gr	Ref.			
Above 2500 gr	0.514	0.273	0.969	0.04
Treatment of water				
Boiled water	0.943	0.612	1.455	0.792
Filter water	1.823	1.123	2.959	0.015
No treatment of water	Ref.			

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Table 5 (continued)

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
Sanitation facility				
Yes	Ref.			
No	4.131	1.833	9.312	0.001
Handwashing practices				
Yes	Ref.			
No	1.569	1.067	2.309	0.022
Malaria infection				
Yes	Ref.			
No	0.377	0.152	0.936	0.035
Diarrhea				
Yes	Ref.			
No	0.332	0.136	0.811	0.016
Milk support				
No	Ref.			
Yes	0.22	0.125	0.389	0.001
Ongera intungamubiri				
No	Ref.			
Yes	0.237	0.159	0.353	0.001
Still breastfeeding				
Yes	Ref.			
No	4.599	2.913	7.26	0.001
Complementary breastfeeding				
Before six months	Ref.			
After six months	0.526	0.359	0.771	0.001
Eating vegetables				
Yes	Ref.			
No	1.9	1.181	3.057	0.008
Eating fruits				
Yes	Ref.			
No	1.695	1.153	2.492	0.007

Table 5 (continued)

Variables	Adjusted OR (AOR)	95%CI		p-value*
		Lower limit	Upper limit	
Eating meat				
No	Ref.			
Yes	0.507	0.315	0.813	0.005
Eating fishes or small fishes				
Yes	Ref.			
No	1.651	1.105	2.467	0.014
Eating eggs				
Yes	Ref.			
No	2.012	1.374	2.944	0.001

Source: Primary data, 2021

Concerning underweight, female children were 2.3 times more likely to be underweight than male children (AOR: 2.3, 95%CI: 1.5-3.4, p=0.001), children from households without toilets were 4.1 times more likely to be underweighted than the children from households with hygiene sanitation (AOR: 4.1; 95%CI: 1.8-9.3, p=0.001), mothers who did not practice hand washing were 1.5 times more likely to have underweight children than those who used to wash their hands (AOR: 1.5; 95%CI: 1.06-2.3, p=0.022), children who started to breastfeed later were 4.5 times more likely to be underweighted than the children who started to breastfeed within the first hour of life (AOR: 4.5, 95%CI: 2.9-7.2, p=0.001), children who did not eat vegetables were 6.2 times more likely to be underweight than the children who ate vegetables (AOR: 6.2; 95%CI: 3-12.8), children who did not eat fruits were 1.6 times more likely to be underweight than the children who ate fruits (AOR: 1.6, 95%CI: 1.1-2.4, p=0.007), and children who did not eat eggs were 2.9 times more likely to be underweight than the children who ate eggs (AOR: 2, 95%CI: 1.3-2.9, p=0.001).

Discussion

The purpose of this research was to determine the prevalence and factors associated with undernutrition among children aged 6 to 59 months in Ngoma District, Rwanda. In Rwanda, the prevalence of under nutrition (stunting, wasting and underweight) among children aged 6-59 months was 33.7%, 3.6% and 6.6%, respectively. In contrast, prevalence of under nutrition in Ngoma District was found high than the country level as reported by the DHS 2019-2020 (32.5% stunting, 0.7% wasting and 8.5 % underweight) and high compared to the WHO cut-off value (< 20% stunting, < 5% wasting and < 10% underweight) [8].

Prevalence of stunting was lower at 33.7% in Ngoma District compared to the results of comprehensive food security and vulnerability analysis in 2018 where the report showed the stunting rate in Ngoma District was 37% [9]. The difference might be due difference in time and methodology used in this study compared to that of national level.

In this study, female children were 2.3 times more likely to have stunting (AOR: 2.3; 95%CI: 1.599 -3.434) than male children, which is contrary to the study done in Kenya where males were about 1.2 more likely to be stunted than females [10]. Child weight at birth, mothers never attended school, household wealth index at poorest level (1st social category) were less likely to contribute to under nutrition. This finding was consistent with a study done in Rwanda [11] which shows that child age 24-59 months, low child weight at birth, mother's never attended school and household wealth index at the poorest level were contributing factors of stunting.

Low birth weight (less than 2,500g) contributes to poor health outcomes [8]. In this study children born with weight lesser than 2,500g were likely to be affected by under nutrition ($p<0.05$) which was consistent with the study done in Malawi where the childhood under nutrition is significantly associated with low birth weight [12].

Breastfeeding is the foundation of child health [13]. The present study found that late breastfeeding was associated with underweight (AOR: 4.5, 95%CI: 2.9-7.2, $p=0.001$). Contrary to the study done in Kenya where breastfeeding was not associated with wasting [14]. But it was consistent with a study done in Sudan where there was statistical significance between breastfeeding and malnutrition [15].

The study finding showed that minimum dietary diversity was significantly associated with the decrease of under nutrition. This finding was consistent with findings from a study done in Tanzania [16] where eating a diverse diet was significantly associated with the reduction of under nutrition.

Conclusion

In Ngoma District, stunted children were at 33.7 % and wasting at 3.6 % among those ones aged between 6-59 months compared to the national level where stunting was at 32.7 % and wasting at 0.7%. Socio-economic factors associated with under nutrition identified were child gender, water treatment, hand washing practices, and sanitation facility. Feeding practices in infant and young child, feeding the child before six months, breastfeeding, dietary diversity (vegetables, beans, fruits and fishes) were associated with under nutrition among children aged between 6-59 months. Efforts should be made to improve nutritional status for the children under 5 years, to improve the environment where the children live and to educate mothers or caregivers how to prepare a balanced diet specifically for the children under five years.

Competing Interests

The authors have declared that no competing interests exist.

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