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Research Article

Determinants of Stunting among Children Under Two Years in Western Province of Rwanda

Oscar Nduwayo[1,2]* and Solange Nikwigize[2]

[1]*UN World Food Programme/WFP, Kigali, Rwanda*

[2]*Department of Public Health, Mount Kenya University Rwanda, Kigali, Rwanda*

***Corresponding Author:** Oscar Nduwayo, UN World Food Programme/WFP, Kigali City, Rwanda.

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Abstract

Worldwide 155 million children are stunted, of whom 34% live-in Sub-Saharan Africa and in Rwanda 33% of children under five years are stunted. The objective of this study mainly is to assess stunting's determinants in under-two-year children in western province. The study design of cross section has been used with quantitative approach. A sample of 369 caregivers and children was enrolled in the study using a two-stage cluster sampling with the first stage being selection of clusters (villages) based on the probability proportional to population size (PPS) approach. Logistic regression analysis was performed to determine the determinants of stunting at a significant level of < 0.05. In this study, the majority of children 64.5% were female and 39.8% of families had two children under-two years old. This study revealed that 43.6% had stunting while 56.4% were not stunted. Bivariate analysis revealed that there were socio-demographic factors associated with stunting including head of household, number of children under two years old and water treatment and socio-economic factors like source of income, kind of vegetables planted in kitchen garden, water treatment source of income, kind of vegetables planted in kitchen garden, whether the has the child been sick the last two weeks, the type of illness and whether the child received deworming tablet within the last 6 months with < 0.05 P-value calculated to 95% CI. The children who didn't taken for deworming in last six months were less likely to be stunted [AOR = 0.497; 95%CI = 0.312 - 0.792; P = 0.003] compared to children took medicine of deworming. The government of Rwanda must keep put into consideration the children under two years old.

Keywords: *Stunting; Under-Two Years' Children; Western Province*

Introduction

Childhood chronic malnutrition remains one of the most critical challenges for human development world widely and when started too early, it results in diminished cognitive and physical development affecting the rest of children's lives [1].

The burden of stunting is most prevalent in the Eastern African region (37% stunted) and in sub-Saharan Africa (SSA), 34% of children aged less than five years are stunted currently and the children who are more likely be stunted are the one living in poor household [2].

World Health Organization indicates that over the past two decades, the global prevalence of stunting in under-five children has declined from 32.4% in 2000 to 21.3% in 2019. In fact, remarkable improvements and reduction of stunting prevalence have achieved in some regions.

A person's lifetime could be affected by chronic malnutrition when he/she is suffered from it in early years of growing. Many health researchers have realized that the severity of specific pathologies and increases the risk of death is intensified by under nutrition during that specific period of childhood [3].

Commission of Economic for Latin American and the Caribbean and WFP stated that, chronic malnutrition occurred in early childhood can cost countries up to 11% of their GDP in terms of lower wages and lost productivity. It is an intergenerational chronicity where Children born to stunted women are themselves likely to be stunted and tightens the noose of poverty to the next generation.

The conceptual framework of UNICEF about undernutrition serves to lead several multi-sectoral interventions at multi-dimensional approaches like shifting from macro to micro levels of focus.

In 2019, in South Asia, about two out of five stunted children while another two out of five lived in sub-Saharan Africa [4].

WHO declared that boys and girls are almost likely to be stunted equally, but affects more boys than girls in sub-Saharan Africa stunting.

Since 1990, reduction of stunting in children from 56, 8% to 38% by 2015 has been made in Rwanda. Nevertheless, rates of stunting remain high as indicated in above paragraph.

In 2012, study Cost of Hunger in Rwanda states that stunting reduces the speed of country development non-stunted children has less-grade of repetition rate at 9.4% compared to stunted one with rate of 12.7%. That study also shown that in Rwanda 49.2% of adults suffered from stunting at childhood stage. For example, in rural area of Rwanda, where most people live with manual activities like farming, carpentry and man-made manufacturing; it is estimated that 40.4 billion RWF were not produced in 2012 alone due to a lower capacity of stunted adult person.

Although chronic malnutrition in Rwanda is still a problem of public health of high importance in decision making, many actions and initiatives have been implemented to reduce its rate, the reduction of malnutrition which is chronic in under 2 years children is now taken as national priority and it was specifically noted in 2013 - 2018 (EDPRS II). Essentially, those actions and initiatives include the Presidential Initiative to Eliminate Malnutrition (2009) and Initiation of 1000 days campaign to prevent child stunting in 2013. Even if interventions and programs to eradicate chronic malnutrition have been implemented still it is a problem of public health of high importance for decision making. To eradicate it requires to know its real causes, it's why this study is intended to reveal the determinants of chronic malnutrition in under-two year children as revealed ones are broad for under-five children. Hence, a plan to eliminate all forms of malnutrition has developed by Rwandan government with a special focus on growth monitoring. Numerous interventions are being implemented under this plan, including supplementation of micronutrient to mother and child, deworming, 1000 days campaign to change mothers' behaviors regarding breastfeeding and complementary diet and child hygiene and care.

Karongi and Rutsiro are food insecure districts and have been chosen as the study area since they are among districts with high prevalence of stunting ranking 4th and 7th with 49% and 46% respectively. For better understanding of the challenges persistence to reducing stunting in Karongi and Rutsiro districts, this study generated some major risk factors that enabled decision makers and planners to design strategies that can improve the health status of under 2 years children.

Methods

Study design

Quantitative research was applied in this study and a representative sample has been chosen throughout a cross sectional study design as the framework to assess the influencing risk factors among stunting in West Province, Rwanda.

Target population

The study population was 4,480 under 2-year children and their mothers or caregivers in Karongi and Rutsiro districts that are located in the Western Province. Karongi District has an area of 993 km^2 with a population of 331,571 distributed into 77,000 households. Karongi District is divided into 13 sectors, it is subdivided into 88 cells and 538 villages. Rutsiro is bordered by Rubavu to the north, Nyabihu and Ngororero districts to the east, Karongi district to the south, Lake Kivu and Democratic Republic of Congo to west. Rutsiro District stretches over an area of 1,157.3 km^2 with a population of 324,654 distributed into 68,000 households. Rutsiro District is divided into 13 administrative sectors, it is subdivided into 62 cells and 483 villages.

Sample size and sampling procedure

A sample size was chosen from all under 2-year children and their mothers or caregivers in Karongi and Rutsiro districts. Sample size necessary was calculated using Cochran' sample size formula and by calculation 369 participants was a sample size. This formula is chosen since the expected prevalence of stunting is known (40%), estimated as per the Rwanda Demographic and Health [5]. The sampling design was a two-stage cluster sampling with the first stage being selection of clusters (villages) based on the probability proportional to population size (PPS) approach that utilizes systematic selection of villages from the list of all villages in the Districts, this list was obtained from the database of the District. The size of the villages was in proportion to the number of children under two years according to hospitals reports (Kibuye referral hospital and Murunda District hospital). At stage two, 369 children were selected randomly from the list of all eligible subjects which was provided by Kibuye Referral Hospital and Murunda district hospital.

Reliability and validity of questionnaire

The questionnaire which was used in this study was adopted from different studies and is based on the internationally recognized protocols used in this study thus if applied in the similar study it would yields the same results. The digital weighing scales and height boards which were used are validated by the ministry of health of Rwanda and UNICEF, prior to being used in the study, the weighing scales were calibrated to ensure accurate measures.

Validity and Reliability are intertwined in determination of quality of research; thus, the dataset was evaluated with SPSS using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy to assess the appropriateness of using factor analysis on the data set and Bartlett's test of sphericity to compare correlation matrix to check if there is a variety of parameters that can be summed up using a few variables. Furthermore, the questionnaire was pretested by conducting pilot study to ensure its reliability and validity to being used in the actual research.

Data analysis and ethical consideration

All data was entered in MS excel and anthropometric data was then imported into WHO Anthro software version to generate HAZ, Anthropometrics statuses were defined under World Health Organization classification: Overall stunting prevalence was classified as (HAZ < -2), for details, check on appendix V. The relationship between variables was analyzed using SPSS (version 21): Descriptive statistics was further used classify and explain the features of a family and Pearson chi-square test was used for bivariate analysis of the effects of independent variables on dependent variable as well as logistic regulation was performed to check the strength between significant variables which was associated with stunting. Written permission to conduct the study was granted by both Mount Kenya University and Karongi and Rutsiro districts. The voluntary participation of households in the study was applied after being explained of the purpose of the survey. The identities of the respondents were strictly kept confidential. Necessary use of resources shall be avoided more especially by respecting the register book of objectives and aims to be achieved.

Results

Demographic characteristics of respondents

As indicated in table 1, those are socio-demographic characteristics of 369 respondents all reached and data collected using questionnaire through face to face interview.

Variables	Frequency	Percentage
Head of house hold		
Father	318	86.2
Mother	51	13.8
Number of under five children		
One child	226	61.2
Two children	143	38.8
Educational Level of house hold		
None	24	6.5
Primary	207	56.1
Secondary	138	37.4
Education level of caregiver		
None	57	15.4
Primary	190	51.5
Secondary	122	33.1
Source of Water		
Piped Water at home	44	11.9
Public tap	258	69.9
River	67	18.2
Water treatment		
Boil	226	61.2
Water filter	143	38.8
Means of washing hands		
Nothing	51	13.8
Water and soap	318	86.2
Sex of the Child		
Male	131	35.5
Female	238	64.5

Table 1: *Socio-demographic characteristics of respondents.*

Source: Primary data.

The table 1 above shows that the majority of studied children 238 (64,5%) were females while 131 (35%) were males. 318 (86.2%) fathers were head of households, 226 (61.2%) families had single child under-two years old while (39.8%) families had two children

under-two years old and the majority of households 207 (56.1%) had primary level of education and the same applies on education level of care givers, the majority of the 190 (51.5%) had primary level of education. 258 (69.9%) families used to get water from public tap, 226 (61.2%) families used boiling method as water treatment and 318 (86.2%) families washed their hands by using water and soap.

Socio-economic factors

The table 2 below presents the socio-economics of parents or caregivers of under-two years old children located in Nyabihu District.

Variables	Frequency	Percentage
Source of income		
Crop farming	146	39.6
Business	81	22
Employed	142	38.5
Do you have toilet		
Yes	336	91.1
No	31	8.4
Do you have land?		
Yes	229	62.1
No	140	37.9
Do you have animals?		
Yes	244	66.1
No	125	33.9
Do you have kitchen garden?		
Yes	319	86.4
No	50	13.6
Kind of vegetables		
Onion	91	28.5
Carrot	38	12
Green leafy vegetables	190	59.5
Has the child been sick the last two weeks?		
Yes	123	33.3
No	246	66.7
Type of illness		
Diarrhea	48	39
Cough	75	61
Deworming		
Yes	303	82.1
No	66	17.9
Vaccination		
Yes	323	87.5
No	46	12.5

Table 2: *Socio-economic factors.*

Source: Primary data.

The table 2 is shows that 146 (39.6%) families used to get the source of income from crop farming, the majority of families 336 (91.1%) agreed that they have toilets, 229 (62.1%) families agreed that they have land and 244 (66.1%) families said that they have animals. 319 (86.4%) families had kitchen gardens and the majority of 190 (59.5%) families planted Green leafy vegetables in their kitchen garden. 123 (33.3%) families said that the child been sick the last two weeks and among children fallen in sick 48 (39%) had diarrhea.

Presentation of findings

The findings of this study are presented according to their research objectives which are to determine the prevalence of stunting, to identify socio-demographic factors, to determine the socio-economic factors associated with stunting among children under two years in Western province of Rwanda.

Prevalence of stunting among under two-year children in Western province of Rwanda

The objective one was to determine the prevalence of stunting among children under two years in Western province of Rwanda and was determined by considering height-for-age is -2 degrees of separation underneath the WHO child development standard median.

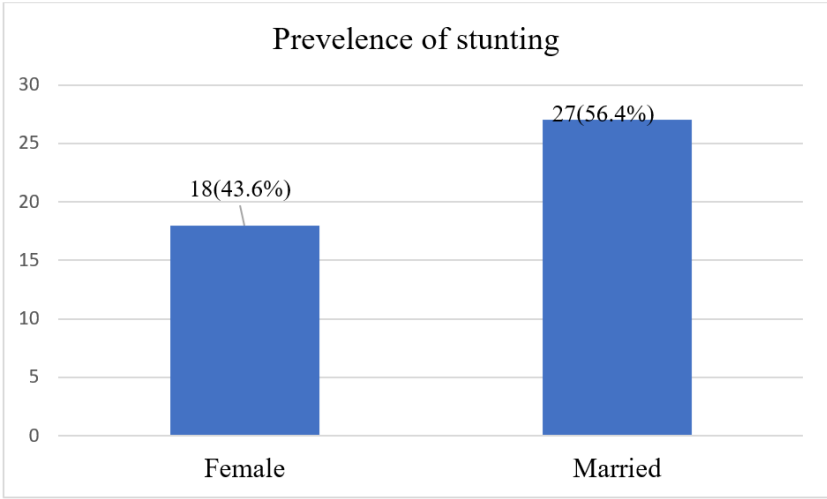

Figure 1: *Prevalence of stunting.*

Source: Primary data.

The figure 1 above presented the prevalence of stunting where 208 (56.4%) were not stunted and 161 (43.6%) had stunting.

Socio-demographic factors associated with stunting among children under two-year children living in Western Province (Bivariate analysis)

Objective two was to identify socio-demographic factors among children under two years in Western province of Rwanda and it include eight variables related to socio-demographic.

Variables	Stunting		P-Value
	Stunted	Not Stunted	
Head of house hold			
Father	150 (47.2%)	168 (52.8%)	0.001
Mother	11 (21.6%)	40 (78.4%)	
Number of under five children			
One child	76 (33.6%)	150 (66.4%)	<0.001
Two children	85 (59.4%)	58 (40.6%)	
Educational Level of house hold			
None	6 (25%)	18 (75%)	0.159
Primary	94 (45.4%)	113 (54.6%)	
Secondary	61 (44.2%)	77 (55.8%)	
Education of caregiver			
None	16 (28.1%)	41 (71.9%)	0.005
Primary	97 (51.1%)	93 (48.9%)	
Secondary	48 (39.3%)	74 (60.7%)	
Source of Water	54.50%	45.50%	0.15
Public tap	113 (43.8%)	145 (56.2%)	
River	24 (35.8%)	43 (64.2%)	
Water treatment			
Boil	113 (50%)	113 (50%)	0.003
Water filter	48 (33.6%)	95 (66.4%)	
Washing hands by			
Nothing	27 (52.9%)	24 (47.1%)	0.172
Water and soap	134 (42.1%)	184 (57.9%)	
Sex of the Child			0.228
Male	63 (48.1%)	68 (51.9%)	
Female	98 (41.2%)	140 (58.8%)	

Table 3: *Socio-demographic factors associated with stunting among children under two-year children living in Western Province (Bivariate analysis).*

Source: Primary data.

As indicated in the table 3, there was statistically significant association between head of household, number of children under two years old and water treatment and stunting with 0.001 P-value calculated to 95% CI.

Socio-economic factors associated with stunting among children under two years in Western province of Rwanda

Objective three was to determine factors associated with stunting among children under two years in Western province and it include eight variables related to socio-economic.

Variables	Stunting		P-Value
	Stunted	Not Stunted	
Source of income			
Crop farming	65 (44.5%)	81 (55.5%)	< 0.001
Business	49 (60.5%)	32 (39.5%)	
Employed	47 (33.1%)	95 (66.9%)	
Do you have toilet			
Yes	145 (43.2%)	191 (56.8%)	0.304
No	16 (51.6%)	15 (48.4%)	
Do you have land			
Yes	104 (45.4%)	125 (54.6%)	0.389
No	57 (40.7%)	83 (59.3%)	
Do you have animals?			
Yes	115 (47.1%)	129 (52.9%)	0.06
No	46 (36.8%)	79 (63.2%)	
Do you have kitchen garden?			
Yes	145 (45.5%)	174 (54.5%)	0.09
No	16 (32%)	34 (68%)	
Kind of vegetables			
Onion	58 (63.7%)	33 (36.3%)	<0.001
Carrot	16 (42.1%)	22 (57.9%)	
Green leafy vegetables	84 (44.2%)	106 (55.8%)	
Has the child been sick the last two weeks?			
Yes	29 (23.6%)	94 (76.4%)	<0.001
No	132 (53.7%)	114 (46.3%)	
Type of illness			
Diarrhea	10 (20.8%)	38 (79.2%)	<0.001
Cough	48 (64%)	27 (36%)	
Did the child receive de worming tablet within the last 6 months?			
Yes	148 (48.8%)	155 (51.2%)	< 0.001
No	13 (19.7%)	53 (80.3%)	
Did the child ever receive any vaccinations			
Yes	146 (45.2%)	177 (54.8%)	0.115
No	15 (32.6%)	31 (67.4%)	

Table 4: *Socio-economic factors associated with stunting among children under two years in Western province of Rwanda (Bivariate analysis).*

Source: Primary data.

The table 4 also shows that, there was statistically significant association source of income, kind of vegetables planted in kitchen garden, whether the has the child been sick the last two weeks, the type of illness and whether the child received deworming tablet within the last 6 months and stunting with 0.001 P-value calculated to 95% CI.

Variables	AOR	95% C.I for AOR		P-Value
		Lower	Upper	
Head of house hold				
Father	Ref			
Mother	0.998	0.357	1.148	< 0.001
Number of under five children				
One child	0.0071	0.006	0.16	0.03
Two children	Ref			
Water treatment				
Boil	0.078	0.101	1.128	0.338
Water filter	Ref			
Source of income				
Crop farming	0.31	0.024	3.273	0.28
Business	0.046	0.004	0.947	0.063
Employed	Ref			
Kind of vegetables				
Onion	1.297	1.172	4.191	0.04
Carrot	0.713	1.694	5.133	1.772
Green leafy vegetables	Ref			
Has the child been sick the last two weeks?				
Yes	0.145	0.556	54.911	5.524
No	Ref			
Type of illness				
Diarrhea	Ref			
Cough	0.214	0.0677	3.611	0.02
Deworming				
Yes	Ref			
No	0.497	0.312	0.792	0.003

Table 5: *Socio-economic factors associated with stunting among children under two years in Western province of Rwanda (Multivariate analysis).*

Source: Primary data.

The study findings form multivariate analysis revealed that within the families where the household was a mother, the children were less likely to be stunted [AOR = 0.998; 95%CI = 0.357 - 1.148; P = < 0.001] compared to families where the fathers were the household. The families with one child under two years old, their children were less likely to be stunted [AOR = 0.0071; 95%CI = 0.006 - 1.148; P =

< 0.003] compared to the families with two children under two years old. The families which used to plan onions in their kitchen garden, their children were more likely to be stunted [AOR = 1.297; 95%CI = 1.172 - 4.191; P = 0.04] compared to the families which preferred to plant green leafy vegetables and The children who fallen sick and suffer from cough in the last two weeks, they were less likely to be stunted [AOR = 0.214; 95%CI = 0.067 - 3.611; P = < 0.002] compared to the children who suffered from diarrhea. The process of elimination of parasitic worms by using appropriate medicine, is known as deworming. The findings from multivariate analysis revealed that children who didn't taken for deworming in last six months were less likely to be stunted [AOR = 0.497; 95%CI = 0.312 - 0.792; P = 0.003] compared to children took medicine of deworming. This means that the children who have been taken for deworming are the one with worms in their stomach and this can affect the nutritional status of a child and lead to the stunting.

Discussion

The aim of this study was to determining the determinants of Stunting among under two-year children and the present study revealed that among those children a significant percentage of 43.6% was stunted and this was almost a half of study population.

There were different factors associated with stunting including head of household, number of children under two years old, water treatment source of income, kind of vegetables planted in kitchen garden, whether the has the child been sick the last two weeks, the type of illness and whether the child received deworming tablet within the last 6 months.

The previous study conducted by Anthony was in the same not line with present study where revealed that children who live in poor sanitation where pathogens and heartworm disease are more likely to infect the setting, disrupting digestion process and weakening the immune response. Immune deficiency makes them more susceptible to chronic pathogens [6]. There are a number of environment determinants that were proven to increase the risks of childhood stunting, for instance the lack of access to better-quality sanitation was found to be linked with stunting in childhood, the issue of not owning the basic latrine in a given household and/or the high rates of lack of latrine in a given area is mostly subject to increasing the risks of stunting among the children [7].

The present study revealed that children who didn't taken for deworming in last six months were less likely to be stunted compared to children took medicine of deworming. This factor shown statistical association with stunting among children under two years old.

This was contrary with study conducted from University of Toronto jointly with Aga Khan University in Pakistan, which revealed that socioeconomic status, maternal health services access and pregnancy spacing constituted the main immediate drivers of stunting among children [8].

The study conducted from central region of Mozambique, was not in the same line with the present study on different factors associated with stunting where its results showed that birth weight, mother's educational status, maternal occupation, living in a rural area, family size, number of children under two years of age in the household, cooking with charcoal, inhabiting wooden or straw housing or housing without proper floors, overall duration of breastfeeding as well as duration of exclusive breastfeeding, and time of initiation of complementary feeding were significantly related to stunting [9].

Conclusion

The purpose of this study was to determining the determinants of Stunting among under two-year children in Western province of Rwanda. The study revealed that in general almost a half of study population (study children under two years old in Western province) had stunting and that stunting was statistically associated with some both socio-demographic and economic characteristics. The government of Rwanda must keep put into consideration the children under two years old by working hand in hand with different organizations

that dealing with children to ensure strong collaboration, communication and partnership for effective fight against stunting. It has also to focus on reinforce ECD program and strategically involve local administration into 1000 days campaign and other initiatives that address childhood stunting.

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