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FACTORS ASSOCIATED WITH STUNTED GROWTH AMONG CHILDREN AGED BETWEEN 6 AND 59 MONTHS IN KAMONYI DISTRICT, RWANDA

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[doi:10.48047/AFJBS.7.7.2025.312-335](https://doi.org/10.48047/AFJBS.7.7.2025.312-335)**Abstract**

In Kamonyi District, the prevalence of stunting was reported as 23% according to the Demographic and Health Survey of 2019-2020. Different interventions have been implemented in the framework of fighting stunting in Kamonyi District. However, despite all these interventions, stunting still persists. Studies have affirmed that several factors influence the stunting situation of the children. However, the situation of such practices is not known in Kamonyi District. Therefore, identifying the factors associated to stunted growth is crucial for setting up adequate strategies to address malnutrition in regions with a high prevalence of stunting. The objective of this study is to determine the prevalence of stunted growth and to establish the factors related to stunted growth among children aged between 6 and 59 months in Kamonyi District. The study used a cross-sectional analytical study design to get data from mothers who have under five children residing in Kamonyi District. The sample size of 395 respondents was obtained from the target population using Yamane's formula. A questionnaire was used as data collection instrument. Data was analyzed using descriptive statistics of frequencies, percentages, and simple regression analysis at 95% level of significance in evaluating significant relationship between different factors and the stunting situation of the children. A descriptive statistic; bivariate and multivariate analyses was carried out to evaluate the significant factor in regard to the stunting situation of the children. The findings demonstrated that 25.3% of the children presented stunted growth while 74.7% were not stunted. In addition, children born to unmarried couples were twice as likely to experience stunted growth compared to those from married couples (AOR=2.6, 95% CI: 1.475, 4.788, P=0.001). Similarly, children from larger families (more than 7 persons) faced double the odds of stunting compared to those from smaller families (AOR 2.1 95% CI: 1.296, 3.403, p=0.003). Maternal headship of families also doubled the likelihood of stunting among children (AOR= 1.9, 95% CI: 1.244, 3.193, P=0.0049), while inadequate breastfeeding (less than 6 months) tripled the risk (AOR= 3.6, 95% CI: 2.272, 5.992, P=0.008). Children receiving only milk as supplementary food had a 2.6-fold higher odds of stunting compared to those receiving a balanced diet (AOR 6.9, 95% CI: 1.338, 5.271, p=0.005). Lack of enriched supplementary food increased the odds of stunted growth by 1.9 time (AOR=1.9, 95%CI: 1.208, 3.025, P=0.006). Moreover, children eating only one meal a day were three times more likely to be stunted than those eating three meals (AOR=3.6, 95%CI: 1.663, 8.096, P=0.002). Additionally, maternal education, household wealth index, maternal employment status, and maternal visits to nutritional centers were found significantly associated with child stunting, emphasizing the complex interplay of socio-economic factors in child nutrition outcomes. These findings underscore the need for targeted interventions addressing maternal education, household income, feeding practices, and access to nutritional support to combat child stunting effectively.

Key words: Factors, Stunted Growth, Children Aged Between 6 And 59 Months, Kamonyi District, Rwanda

Introduction

Stunting remains a pervasive global challenge, particularly affecting children in low- and middle-income countries. Despite advancements in healthcare, nutrition, and overall economic development, millions of children under the age of five continue to face the detrimental consequences of stunting. According to the World Health Organization (WHO, 2021), over 148 million children worldwide are stunted, representing 21% of the total number of children (Ntsame, 2019). The prevalence of stunting varies globally, ranging from 5 to 65% in less-developed countries, with a noticeable concentration in South Asia and Sub-Saharan Africa (WHO, 2021). This persistent issue underscores the complex and multifaceted nature of stunting, which arises from a combination of inadequate nutrition, recurrent infections, and socio-economic disparities (Giashuddinet al., 2019).

The roots of stunting are deeply embedded in poverty and limited access to nutritious food. Families in economically disadvantaged regions often struggle to provide their children with a balanced diet rich in essential nutrients. Malnutrition during the critical early years of life hampers physical and cognitive development, leading to long-term consequences that extend into adulthood. Furthermore, stunting is exacerbated by factors such as inadequate sanitation, limited access to clean water, and poor healthcare infrastructure, amplifying the challenges faced by vulnerable communities (FAO, 2022).

The impact of stunting goes beyond the immediate health implications, affecting educational attainment and economic productivity in the long run. Stunted children often face cognitive deficits and learning difficulties, hindering their academic performance and limiting their potential in various aspects of life. As a result, addressing stunting requires a holistic approach that encompasses not only nutritional interventions but also broader initiatives to improve living conditions, healthcare access, and socioeconomic opportunities for vulnerable populations. Tackling stunting remains a crucial global health priority to ensure that every child has the opportunity to reach their full physical and intellectual potential (Vereecken & Maes, 2020).

In Africa, stunting remains a pressing and widespread issue in different countries, posing a significant health and development burden across the continent. According to the World Bank

and other global health organizations, sub-Saharan Africa bears a disproportionate share of the global burden of stunting, with many countries grappling with high prevalence rates. Inadequate nutrition, coupled with challenges such as food insecurity, limited access to clean water, and insufficient healthcare infrastructure, contribute to the persistence of stunting in numerous African nations (WHO, 2021).

The prevalence of stunting varies across African countries, reflecting the complex interplay of socio-economic factors. For example, countries such as Chad, Niger, and the Democratic Republic of the Congo consistently report high rates of stunting among children under five reaching 41%, 43% and 48% respectively (FAO, 2022). These disparities highlight the regional inequalities in nutrition, healthcare, and overall development. Rural areas and marginalized communities often face higher rates of stunting, exacerbating existing disparities in health outcomes (Eyob & Diane, 2022).

Stunting's impact goes beyond individual health, affecting the broader development goals of African nations. Malnutrition during the critical early years of life hampers cognitive development and can lead to long-term consequences such as reduced educational attainment and diminished economic productivity. As African countries strive to achieve sustainable development targets, addressing stunting becomes integral to promoting human capital, breaking the cycle of poverty, and fostering overall socio-economic advancement (Michaël, 2019).

Efforts to combat stunting in Africa, especially in Ghana, Kenya and Cameroun require a comprehensive and coordinated approach that addresses not only nutritional interventions but also broader issues of poverty, access to education, healthcare infrastructure, and social equity. Collaborative initiatives between governments, non-governmental organizations, and international partners are essential to create effective strategies that target the root causes of stunting and work towards building healthier and more resilient communities across the continent (Umeta et al., 2019).

In Rwanda, despite commendable progress in various sectors, stunting remains a significant public health concern. Stunting is defined as impaired growth and development in children due to chronic malnutrition, and it continues to affect a considerable number of Rwandan children under the age of five. According to data from the Rwanda Demographic and Health Survey

(RDHS), the prevalence of stunting in Rwanda is substantial, with rates varying across regions and between rural and urban areas. For example, 32% of children under five in Rwanda are stunted, indicating chronic malnutrition in over 2.1 million young children, with 13% underweight and 6% wasted and rural areas being the most affected (National Institute of Statistics of Rwanda, 2021).

Several factors contribute to the persistence of stunting in Rwanda. Limited access to diverse and nutritious food, particularly in rural communities, is a key challenge. Malnutrition is often exacerbated by inadequate water and sanitation infrastructure, making children more susceptible to infections that can further compromise their growth. Additionally, socio-economic factors, such as poverty and disparities in healthcare access, play a role in perpetuating the prevalence of stunting in certain populations (Giashuddinet al., 2019).

Efforts to address stunting in Rwanda involve a multi-faceted approach, with the government working in collaboration with international organizations and non-governmental entities. Interventions include nutritional education, improvement of agricultural practices, and the promotion of breastfeeding (MoH, 2020). Despite these initiatives, stunting rates highlight the need for sustained efforts to enhance food security, improve healthcare infrastructure, and address socio-economic inequalities. The government's commitment to achieving the Sustainable Development Goals, which include targets related to nutrition and health, underscores Rwanda's determination to overcome the challenges posed by stunting and improve the well-being of its youngest population. Therefore, this study aimed to evaluate the situation of that problem in Kamonyi District, seeking to understand the reasons behind the high stunting rates in that region of Rwanda.

In Kamonyi District, the prevalence of stunting was reported as 23% according to the Demographic and Health Survey of 2019-2020 (National Institute of Statistics of Rwanda, 2021). The Sustainable Development Goal (SDG) Target 2.2 aims to eradicate all forms of malnutrition, with a specific focus on achieving the internationally agreed targets for reducing stunting and wasting in children under 5 years by 2025. Additionally, the goal is to address the nutritional needs of adolescent girls, pregnant and breastfeeding women, and older individuals (NISR, 2012). Children experiencing malnutrition face increased susceptibility to infectious diseases and

have a higher likelihood of premature death. Persistent undernutrition during the child's early years impedes his/her complete physical and cognitive development, perpetuating a cycle of reduced ability to escape poverty (FAO, 2022).

Different interventions have been implemented in the framework of fighting stunting in Kamonyi District. In addition, different stakeholders are conducting coordinated actions aiming at eradication malnutrition in this District including GIMBUKA, food for the hungry and FXB. In their activities, the following priorities are being highlighted: pregnant and lactating women are being provided with SHISHA Kibondo in order to strengthen their daily diet; different campaigns and events are being implemented to sensitize the population on the importance of fighting malnutrition; the population is being provided with WASH infrastructures to support them in their daily fight against malnutrition. However, despite all these interventions, stunting still persists (Kamonyi District, 2022).

Diverse studies have been done to understand the reason behind the persistence of stunting among under five children despite multiple efforts undertaken to eradicate malnutrition. Mainly, those studies focused on the knowledge, attitude and practices of mothers on matters related to nutrition in some parts of the country. However, a little has been done on identifying the factors associated to stunting situation of children in Kamonyi District (Kamonyi District, 2022). Though, as known, better understanding of the factors associated with stunting is of great importance in the framework of getting the adequate solutions of that problem. This is why the present study is for a great importance as it assesses those factors related to stunting situation of children in Kamonyi District of Rwanda.

Materials and methods

Research design

In this study, the researcher used a cross-sectional research design with quantitative research approach.

Study population

The study encompasses all children aged between 6 and 59 months residing in the Kamonyi District of Rwanda. These are 32,552 individuals according to health report in the District of

Kamonyi (Kamonyi District, 2023). Also, according to the same Report, 23% of children are in the situation of stunting in Kamonyi District.

Sample size

The sample size was calculated based on the formula that was developed by Yamane (Yamane, 1967). According to this formula, Sample size n is:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n is the minimum sample size

N is the population from which the sample was drawn, and it is estimated at 32,552 mothers according to statistics from Kamonyi District (Health Unit Data, 2023).

e is the margin of error, estimated at 5%.

Substituting,

$$n = \frac{32552}{1 + 32552(0.05)^2} =$$

$$n = 395.1 = 395$$

Therefore, the sample is composed of 395 mothers who have given birth to a child who is aged between 6 and 59 months and residing in Kamonyi District. This formula was chosen because it has been used in previous similar studies in similar settings (Cuneen & Tobar, 2017).

Sampling Technique

This study used Systematic random sampling. All the sectors of Kamonyi district provided the number of individuals proportional to their respective number of children aged between 6 and 59 months. Runda provided the highest number (47) based on its highest number of children aged between 6 and 59 months (3852) while Ngamba provided the lowest number (15) based on its lowest number of children aged between 6 and 59 months (1215).

Research instruments

The questionnaire was employed for data collection. These tools are specifically crafted to evaluate nutritional status, offering standardized measures for malnutrition and stunting.

Reliability

The reliability of the tool involved administering the same questionnaire to the same group of respondents at two different time points and then correlating the results to see if they are consistent, this same study used Split-Half Reliability: The questionnaire was divided into two halves, and the responses from each half are compared to assess the internal consistency of the items, the study used Cronbach's Alpha: It was used to measure and to evaluate the internal consistency of a questionnaire with multiple items measuring the same construct. To ensure the validity and reliability of a questionnaire the study clearly defined the objectives and construct wanted to measure, Use established and validated questions whenever possible. Conduct a pilot study to identify potential issues and refine the questionnaire. Use appropriate sampling techniques to select the participants. Administer the questionnaire under standardized conditions. Analyze the data using appropriate statistical methods to assess validity and reliability (Lewis, 2015).

Validity

The validity of the tool assessed whether the items in the questionnaire adequately cover the entire range of the construct being measured. Researchers in the field typically evaluate the content validity to ensure that the questions are relevant and representative of the construct. Construct Validity: It examined the extent to which the questionnaire aligns with other constructs or theories, establishing the relationship between the measured concept and related concepts. Criterion Validity: This determined the correlation between the questionnaire's results and some external criteria that are assumed to be related to the construct being measured. In this study we shall use Face Validity: It is a basic and subjective assessment of whether the questionnaire appears to be measuring what it claims to measure. It did not provide strong evidence of validity but can be useful for initial feedback (Dahabreh *et al.*, 2019).

Data analysis procedure

In addressing the first and second objectives of the study, a comprehensive univariate analysis was initially conducted to provide a detailed description of the respondents' characteristics. Following the univariate analysis, the study proceeded to examine the relationships between the independent and dependent variables, with a particular focus on understanding the factors influencing the stunting situation among children. To achieve this, both bivariate and

multivariate analyses were conducted using binary logistic regression, a statistical method that allows for the assessment of the impact of multiple independent variables on a binary outcome, in this case, the presence or absence of stunting (Lewis, 2015).

The bivariate analysis involved examining each independent variable individually in relation to the dependent variable, providing insights into the potential associations. Variables that showed significant associations at this level were then included in the multivariate analysis. The multivariate analysis allowed for the adjustment of confounding factors, offering a more nuanced understanding of the significant predictors of child stunting.

The level of statistical significance for determining the relationship between variables was set at a P-value of 0.05, meaning that results with a P-value less than or equal to 0.05 were considered statistically significant. Additionally, a 95% confidence level was employed to ensure that the findings were robust and reliable, indicating a high degree of certainty that the results were not due to random chance (Dahabreh *et al.*, 2019).

Ethical consideration

During the research procedure, the researcher explained that the data will remain confidential. Also, concerning information obtained from Kamonyi District, this institution received the letter which explains our objective and interest. In this letter it was very clear that all information received from there would be kept confidential and would be used only as explained. All clearances were sought and obtained from the relevant authorities (Mount Kenya University and Kamonyi District) before the actual fieldwork has to be done. Additionally, the researcher requested consent from the participants and guarantee the respondents the privacy of their responses (Cuneen & Tobar, 2017).

Findings

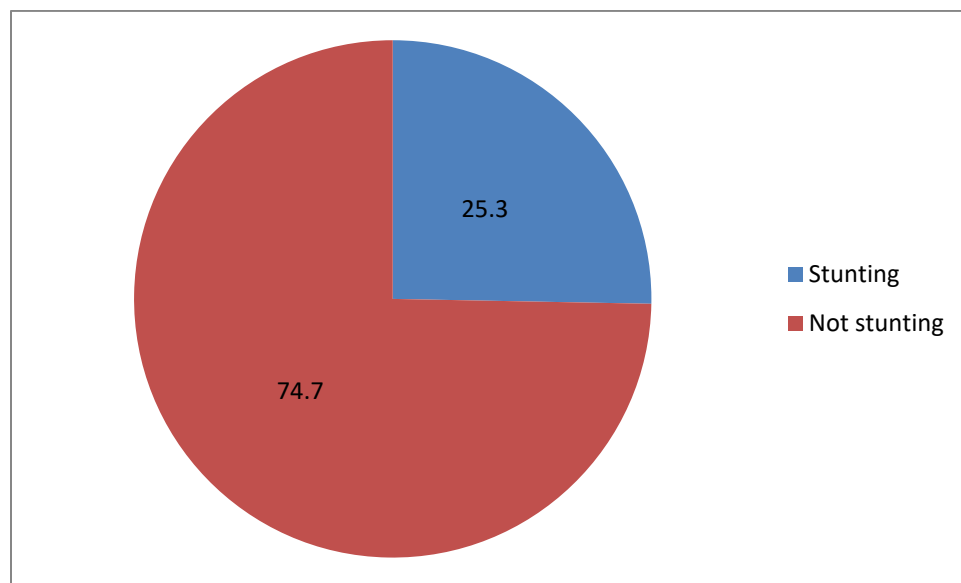
Table 1. Nutritional status of the target child

Variables	Frequency (n=395)	Percentage
Sex of the child		
Male	209	52.9

Female	186	47.1
Period of breastfeeding		
Less than 6 months	180	45.6
6 months and more	215	54.4
Supplementary food		
Milk	145	36.7
Ordinary food	165	41.8
Both milk and food	85	21.5
Received Fortified blended suppl. food		
Yes	240	60.8
No	155	39.2
Received Fortified flower		
Yes	244	61.8
No	151	38.2
Number of meals a day		
1 meal a day	122	30.9
2meals a day	191	48.4
3 meals a day	82	20.8

Source: Primary data, 2024

The findings of this study on the characteristics of the target child as shown in Table 4.4, demonstrated that 52.9% of the target children were male while 47.1% were female. Also, 54.4% of the respondents breastfeed their children during a period exceeding 6 months and 41.8% gave them ordinary food, 36.7% gave them milk while 21.5% gave them both milk and ordinary food as supplementary food. About 60.8% of the children received Fortified blended supplementary food; 61.8% received Fortified flower and 48.4% were used to eat 2 meals a day. In addition, Graph 4.1 below shows the prevalence of stunted growth among the children aged between 6 and 59 months in Kamonyi District, Rwanda.



Graph 1. Prevalence of stunted growth among the children aged between 6 and 59 months in Kamonyi District, Rwanda

The findings of this study on the prevalence of stunted growth among the children aged between 6 and 59 months in Kamonyi District, Rwanda demonstrated that 25.3% of the children presented a stunted growth while 74.7% were not stunted.

Table 2. Bivariate analysis of sociodemographic factors associated with stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda

Particulars	N	Stunted growth		Chi-square	P-value
		Stunted n(%)	Not stunted n(%)		
Age of the mother				0.357	0.837
Less than 25	89	22(24.7)	67(75.3)		
25-44	164	44(26.8)	120(73.2)		
45 and more	142	34(23.9)	108(76.1)		
Marital status				11.115	0.004
Unmarried	62	26(41.9)	36(58.1)		
Married/Cohabiting	248	53(21.4)	195(78.6)		
Widower/Divorced/Separated	85	21(24.7)	64(75.3)		
Family size				9.505	0.009
1-3	40	9(22.5)	31(77.5)		
4-6	208	41(19.7)	167(80.3)		

7 and more	147	50(34)	97(66)		
Head of household				8.377	0.004
Mother	124	43(34.7)	81(65.3)		
Husband	271	57(21)	214(79)		
Religion				0.566	0.904
Catholic	158	37(23.4)	121(76.6)		
Protestant	148	39(26.4)	109(73.6)		
Muslim	69	19(26.4)	50(72.5)		
Others	20	5(25)	15(75)		

Source: Primary data, 2024

Marital status, family income and head of household were the sociodemographic factors with statistically significant association with stunted growth ($p < 0.05$). For marital status, a higher proportion of stunted children was found among unmarried families (41.9%). Similarly, significant associations were found between family size and stunted growth, with the highest proportion observed among families having more than 7 members (34%). Regarding head of household, mother-headed families exhibited a higher proportion of stunted children (34.7%) compared to father-headed families (21%).

Table 3. Bivariate analysis of socio-economic factors associated with stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda

Particulars	N	Stunted growth		Chi-square	P-value
		Stunted n(%)	Not stunted n(%)		
Education level of the mother				8.538	0.036
Uneducated	139	41(29.5)	98(70.5)		
Primary	187	51(27.3)	136(72.7)		
Secondary	51	6(11.8)	45(88.2)		
University	18	2(11.1)	16(88.9)		
Wealth index				8.776	0.012
Category 1	157	50(31.8)	107(68.2)		
Category 2	88	24(27.3)	64(72.7)		
Category 3 & 4	150	26(17.3)	124(82.7)		
Occupation				8.985	0.011
Unemployed	129	42(32.6)	87(67.4)		
Casual job	172	44(25.6)	128(74.4)		
Employed full time	94	14(14.9)	80(85.1)		
Monthly income				13.036	0.002
1-100,000 Rwf	159	51(32.1)	108(67.9)		

100,000-200,000 Rwf	182	45(24.7)	137(75.3)
More than 200,000 Rwf	54	4(7.4)	50(92.6)

Education level of the mother, wealth index, occupation and monthly income were the socioeconomic factors with statistically significant association with stunted growth among children in Kamonyi District ($p < 0.05$). For education level, mothers with lower levels of education (uneducated and primary) had a higher proportion of stunted children (29.5% and 27.3%) compared to those with secondary and university levels (11.8% and 11.1%). Concerning the wealth index, individuals with category 1 showed a higher level of stunted growth (31.8%) compared to those from the categories 3 and 4 (17.3%). Similarly, significant associations were found between the occupations of the mothers and stunted growth of the children, with the high proportion of stunted growth observed among unemployed mothers (32.6%). Concerning the family income, individuals with lower income (1-100,000 Rwf) showed a higher level of stunted growth (32.1%) compared to those from the richest families (7.4%).

Table 4. Bivariate analysis of environmental factors associated with stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda

Particulars	N	Stunted growth		Chi-square	P-value
		Stunted n(%)	Not stunted n(%)		
Access to clean water				0.504	0.478
Yes	225	60(26.7)	165(73.3)		
No	170	40(23.5)	130(76.5)		
Type of toilet				0.049	0.825
Improved	174	45(25.9)	129(74.1)		
Unimproved	221	55(24.9)	166(75.1)		
Visiting nutritional centers				5.622	0.018
Yes	218	45(20.6)	173(79.4)		
No	177	55(31.1)	122(68.9)		

Source: Primary data, 2024

Visiting nutritional centers was the only environmental factor with statistically significant association with stunted growth ($p < 0.05$) with a higher proportion of stunted growth found among those not visiting nutritional centers (31.1%). Other environmental factors presented no significant association with stunted growth.

Table 5. Bivariate analysis of child related factors associated with stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda

Particulars	N	Stunted growth		Chi-square	P-value
		Stunted n(%)	Not stunted n(%)		
Sex of the child				1.296	0.255
Male	209	48(23)	161(77)		
Female	186	52(28)	134(72)		
Period of breastfeeding				29.636	0.001
Less than 6 months	180	69(38.3)	111(61.7)		
6 months and more	215	31(14.4)	184(85.6)		
Supplementary food				8.479	0.014
Milk	145	47(32.4)	98(67.6)		
Ordinary food	165	40(24.2)	125(75.8)		
Both milk and food	85	13(15.3)	72(84.7)		
Received Fortified blended suppl. food				7.766	0.005
Yes	240	49(20.4)	191(79.6)		
No	155	51(32.9)	104(67.1)		
Received Fortified flower food				7.858	0.006
Yes	244	50(20.5)	194(79.5)		
No	151	50(33.1)	101(66.9)		
Number of meals a day				11.711	0.003
1 meal a day	122	38(31.2)	84(68.8)		
2 meals a day	191	53(27.7)	138(72.3)		
3 meals a day	82	9(11)	73(89)		

Source: Primary data, 2024

Period of breastfeeding, supplementary food, receiving Fortified blended and Fortified flower supplementary food and number meals a day were the child-related factors with statistically significant association with stunted growth ($p < 0.05$). For period of breastfeeding, a higher proportion of stunted children was found among those who have been breastfed during a period less than 6 months (38.3%). Similarly, significant associations were found between the kinds of supplementary food used and stunted growth, with the highest stunted children observed among those using milk only (32.4%) compared to those using both milk and ordinary food (15.3%). Regarding Fortified blended supplementary food, those who did not receive it exhibited a higher proportion of stunted growth (32.9%) compared to those who received it (20.4%). Similarly,

significant associations were found between the use of Fortified flower supplementary food and stunted growth, with the higher proportion of stunted children observed among those who did not receive Fortified flower (33.1%). And also, the highest proportion of stunted children was observed among the families eating one meal a day (31.2%) compared to those eating 3 meals a day (11%).

Table 6. Multivariate analysis of factors associated with stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda

Particulars	N	AOR	95% C.I		P-value
			Lower	Upper	
Marital status	395				
Married/Cohabiting		Ref.			
Widower/Divorced/Separated		2.201	1.087	4.456	0.028
Unmarried		2.657	1.475	4.788	0.001
Family size	395				
1-3		Ref.			
4-6		1.775	0.784	4.018	0.168
7 and more		2.100	1.296	3.403	0.003
Head of household	395				
Mother		1.993	1.244	3.193	0.004
Husband		Ref.			
Education level of the mother	395				
Uneducated		3.347	0.736	15.219	0.008
Primary		3.138	1.242	7.925	0.016
Secondary		1.116	.686	1.814	0.659
University		Ref.			
Wealth index	395				
Category 1		1.788	0.951	3.363	0.026
Category 2		1.203	0.851	2.429	0.803
Category 3 & 4		Ref.			
Occupation	395				
Unemployed		2.759	1.402	5.428	0.003
Casual job		1.404	0.849	2.322	0.186
Employed full time		Ref.			
Monthly income	395				
1-100,000 Rwf		5.903	2.022	17.234	0.001
100,000-200,000 Rwf		1.438	0.895	2.309	0.133
More than 200,000 Rwf		Ref.			
Visiting nutritional centers	395				
Yes		Ref.			
No		1.733	1.097	2.737	0.018

Period of breastfeeding	395				
Less than 6 months		3.690	2.272	5.992	0.001
6 months and more		Ref.			
Supplementary food	395				
Milk		2.656	1.338	5.271	0.005
Ordinary food		1.499	0.911	2.465	0.111
Both milk and food		Ref.			
Received Fortified blended suppl. food	395				
Yes		Ref.			
No		1.911	1.208	3.025	0.006
Received Fortified flower	395				
Yes		Ref.			
No		1.921	1.213	3.042	0.005
Number of meals a day	395				
1 meal a day		3.669	1.663	8.096	0.002
2 meals a day		1.178	0.716	1.936	0.519
3 meals a day		Ref.			

Source: Primary data, 2024

As shown in table 6, all independent variables that were significantly associated with stunted growth in bivariate analysis were taken to multivariate analysis to quantify the strength of association with dependent variable. That analysis has indicated that children from unmarried couples were twice more likely to be stunted, compared to their counterparts from married couples with AOR=2.6, 95% CI: 1.475, 4.788, P=0.001). The odd of stunted growth is 2 fold for the children of larger families (more than 7 persons in the family) compared with their counterparts who live in families of 1-3 persons, AOR 2.1 95% CI (1.296, 3.403), p=0.003). Mothers who are heads of families were twice more likely to have stunted children, compared to mothers who live with their husbands (AOR= 1.9, 95% CI: 1.244, 3.193, P=0.004). Uneducated mothers were 3 times more likely to have stunted children, compared to educated mothers (AOR= 3.3, 95% CI: 0.736, 15.219, P=0.008). The odd of stunted growth was 1.7 fold for the children of the families who are recorded in category 1 of ubudehe wealth index compared with their counterparts who are recorded in 3&4 categories, AOR 6.9 95% CI: 1.7 (0.951, 3.363), p=0.026). Children from unemployed mothers were 2.7 times more likely to be stunted, compared to their counterparts from employed mothers with AOR=2.7, 95% CI: 1.402, 5.428, P=0.003). Children from poorest families (with 1-100,000 Rwf of monthly income) were 5 times more likely to be stunted, compared to their counterparts from richer families with AOR=5.9, 95% CI: 2.022, 17.234, P=0.001). The odd of stunted growth is 1.7 fold for the children of the

mothers who visit nutritional centers compared with their counterparts who do not visit nutritional centers, AOR 6.9 95% CI: 1.7 (1.097, 2.737), $p=0.018$). Children who were breastfed for a period less than 6 months were 3 times more likely to be stunted, compared to their counterparts who were breastfed for a period longer than 6 months (AOR= 3.6, 95% CI: 2.272, 5.992, $P=0.008$). The odd of stunted growth is 2.6 fold for the children who received milk only as supplementary food compared with their counterparts who received both milk and ordinary food, AOR 6.9 95% CI: 2.6 (1.338, 5.271), $p=0.005$). The odd of stunted growth is 1.9 fold for the children who did not received Fortified blended supplementary food compared with their counterparts who received Fortified blended, (AOR=1.9, 95%CI: 1.208, 3.025, $P=0.006$). Similarly, the odd of stunted growth is 1.9 fold for the children who did not received Fortified flower supplementary food compared with their counterparts who received Fortified flower, (AOR=1.9, 95% CI: 1.213, 3.042, $P=0.005$). Multiple regression analysis has also shown that children who were eating 1 meal a day were 3 times more likely to be stunted compared to children who were eating 3 meals a day (AOR=3.6, 95%CI: 1.663, 8.096, $P=0.002$).

Discussion

Prevalence of stunted growth among the children aged between 6 and 59 months

The findings from the study on the prevalence of stunted growth among children aged between 6 and 59 months in Kamonyi District, Rwanda, demonstrate that 25.3% of the children presented stunted growth while 74.7% were not stunted. This prevalence rate is lower compared to those reported in other regions. For instance, in Ethiopia, a study conducted in 2020 found a stunting prevalence of 38.4% among children under five years old (Demissie et al., 2020). The significantly higher rate in Ethiopia suggests that stunting is a more severe public health issue there compared to Kamonyi District.

Similarly, the prevalence of stunted growth in India was reported to be 34.7% among children aged between 6 and 59 months (Patel et al., 2021). This figure is also higher than the 25.3% observed in Kamonyi District. The difference in prevalence rates could indicate varying degrees of success in addressing the factors contributing to stunting in these regions. India's higher prevalence rate underscores the more widespread nature of stunted growth compared to Kamonyi District, potentially highlighting the effectiveness of interventions in the latter.

In Nigeria, a 2022 study found that 36.5% of children aged 6 to 59 months were stunted (Eze et al., 2022). This prevalence is again higher than the 25.3% reported in Kamonyi District, Rwanda. The stark contrast between these figures suggests that the conditions or interventions in Kamonyi District may be more favorable for reducing the prevalence of stunted growth. It also highlights the varying levels of public health challenges faced by different regions and the need for context-specific strategies.

Even within Rwanda, a recent study conducted in 2023 found that the national prevalence of stunting among children aged 6 to 59 months was 33.1% (Habimana et al., 2023). Compared to this national average, Kamonyi District's rate of 25.3% is notably lower, indicating better outcomes in this specific district. This difference emphasizes the variability within the country itself and suggests that Kamonyi District might have more effective local health and nutrition policies or better implementation of national programs.

Factors associated with stunted growth

Concerning stunting and parental marital status, this study highlights a significant correlation between parental marital status and child stunting. Children from unmarried couples were found to be twice as likely to be stunted compared to those from married couples, with an adjusted odds ratio (AOR) of 2.6. This finding aligns with various studies, which have consistently underscored the protective effect of marital stability on child nutrition. For instance, a study in Kenya found that children from single-parent households had a 1.8 times higher risk of stunting compared to those from two-parent households (AOR=1.8, 95% CI: 1.25, 2.57) due to reduced economic resources and social support (UNICEF, 2019). This suggests that the structural and economic stability provided by married couples plays a crucial role in ensuring adequate child nutrition and growth.

Concerning family size and stunting, the odds of stunting increased twofold in children from larger families (more than seven members) compared to those from smaller families (1-3 members), with an AOR of 2.1. Recent research corroborates these findings, emphasizing the strain on resources in larger families. A study in Nigeria reported that children from families with six or more members were 2.4 times more likely to be stunted than those from smaller families (AOR=2.4, 95% CI: 1.6, 3.6) (WHO, 2018). Resource dilution, where food, healthcare,

and attention are spread thinly across more children, thereby increasing the likelihood of stunting, is a consistent pattern across different regions, underscoring the need for targeted nutritional interventions and family planning education to mitigate the adverse effects of large family sizes on child growth.

Concerning maternal headship and child nutrition, in Kamonyi District, children of mothers who were the heads of their families were twice as likely to be stunted (AOR=1.9). Similar patterns have been observed in recent studies from various low-income countries, where female-headed households often face economic hardships and social stigmas that limit their access to resources necessary for proper child nutrition. A study in Ethiopia highlighted that children from female-headed households had a 2.2 times higher likelihood of stunting compared to those from male-headed households (AOR=2.2, 95% CI: 1.4, 3.4) (UN Women, 2020). This suggests a broader structural issue that requires comprehensive policy interventions aimed at empowering single mothers economically and socially.

Concerning breastfeeding duration and stunting, the study found a threefold increase in the likelihood of stunting among children breastfed for less than six months compared to those breastfed for longer (AOR=3.6). This is in line with global health recommendations and findings from recent studies, which stress the importance of exclusive breastfeeding for the first six months of life. For instance, research in South Asia indicated that children exclusively breastfed for six months had significantly lower rates of stunting compared to those breastfed for shorter periods (AOR=2.9, 95% CI: 1.9, 4.4) (Lancet Global Health, 2018). These findings advocate for enhanced breastfeeding promotion programs and maternal education on the benefits of extended breastfeeding.

The implications of the study conducted in Kamonyi District are profound, highlighting the urgent need for multifaceted interventions to address child stunting. The findings underscore the critical role of maternal education, economic stability, maternal employment, and access to nutritional centers in improving child nutrition and reducing stunting rates. Policymakers should prioritize educational programs for women, economic support for the poorest families, and employment opportunities for mothers. Additionally, enhancing the accessibility and utilization of nutritional centers can provide essential support for child health. By addressing these

socioeconomic and maternal factors, comprehensive strategies can be developed to combat child stunting effectively, thereby improving overall public health and fostering sustainable development in the region.

However, the study conducted in Kamonyi District, while comprehensive, has several limitations that should be considered. Firstly, the cross-sectional design of the study limits the ability to infer causality between the identified factors and child stunting. Additionally, the reliance on self-reported data may introduce recall bias, particularly regarding maternal education, employment status, and household income. The study's focus on a single district may also limit the generalizability of the findings to other regions with different socioeconomic and cultural contexts. Furthermore, the study did not account for potential confounding factors such as the quality of dietary intake, healthcare access, and environmental influences, which could also impact child stunting. Future research should incorporate longitudinal designs, expand the geographic scope, and include more comprehensive data collection to validate and build upon these findings.

Conclusion

In conclusion, the study conducted in Kamonyi District demonstrated that a quarter of children presented stunted growth. In addition, it highlights significant associations between maternal education, socioeconomic status, maternal employment, household income, and visits to nutritional centers with the prevalence of child stunting. These findings emphasize the need for targeted interventions that address educational, economic, and nutritional disparities to reduce stunting rates effectively. By prioritizing educational programs for women, economic support for low-income families, employment opportunities for mothers, and improved access to nutritional centers, policymakers can develop comprehensive strategies to combat child stunting. These measures are essential for enhancing child health outcomes and fostering sustainable development in the region. The study's insights offer valuable guidance for future research and public health initiatives aimed at improving child nutrition and well-being.

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