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Research Article

Productive and Reproductive Roles of Women and Associated Factors on the Nutritional Status of Children in Kilindi District, Tanzania

Mtagulwa Mzee Hillary, Hadijah Ally Mbwana*

Department of Human Nutrition and Consumer Sciences, Sokoine University of Agriculture, Morogoro, Tanzania

Abstract

Background: The prevalence of stunting can be caused or lessened by the nature of women's productive and reproductive roles. The objective of this study was to examine the risk factors of child stunting based on the productive and reproductive roles of women among crop farmers and agro-pastoralists in Kilindi District. Methods: A cross-sectional survey of 209 crop farmers and 136 agro-pastoralist women with children aged 6–23 months was conducted. A structured questionnaire was used to gather information on household demographics; time allocated for reproductive roles, women's involvement in maize farming and sale of maize produce. Anthropometric measurements were taken to determine the nutritional status of children. The data was analyzed using IBM SPSS version 20. Risk factors of stunting were determined using multivariate logistic regressions. Chi-square was used to determine the relationship between women's involvement in maize farming and the sale of maize in households and stunting. Results: The results from crop farmers revealed that being a male had an increased possibility of stunting by 2.601 times compared to being female (OR = 2.601, 95% CI; 1.302, 5.196). Children aged 13-18 months (OR = 2.820, 95% CI; 1.295, 6.143) and 19-23 months (OR= 4.999, 95% CI; 1.829, 13.664) increased the likelihood of stunting by 2.820 and 4.999 times respectively compared to children aged 6-12 months. Mothers with no formal education augmented the chance of being stunted by 2.212 times compared to mothers with primary education (OR = 2.212, 95% CI; 1.019, 4.799). There is a decreasing probability of children being stunted as time spent on cooking between 21 and 30 hours per week among agro-pastoralist women. Crop farmer women who collected firewood between 11 and 15 hours per week had a 0.205 times lower risk of increasing stunting. Children's age, gender, and mother's level of education all increased the likelihood of stunting among crop farmers. Cooking time (21-30 hours per week) among agro-pastoralists and collection of firewood (11-15 hours per week) among crop farmers had a lower risk of increasing the likelihood of stunting. Nutritional interventions should address maternal education, proper child care, and feeding practices.

Keywords

Productive Roles, Reproductive Roles, Stunting, Nutritional Intervention

*Corresponding author: hadija27@yahoo.com (Hadijah Ally Mbwana)

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1. Introduction

Women play a significant role in ensuring household food security in every aspect. Their contribution to farming is substantial and plays a critical role in ensuring household food access and income generation [1]. Women in Tanzania, like in other developing countries, work longer hours and have a wider range of activities and responsibilities compared to men [2]. The occurrence of stunting, underweight, and wasting can be influenced or mitigated by the nature of women's productive responsibilities. It was reported that the occurrence of stunting (17%), wasting (8%), and underweight (10%) were substantially linked to the mother's work and were more prevalent among children of farmers (22.1%) compared to public servants (12.8%) [3]. According to the study, when the effort increases in crops, animal husbandry, and off-farm activities, there will be corresponding decreases in children's growth by 24.5%, 54.8%, and 24.1% respectively [4]. Rural women have a substantial burden, toiling for an average of 13 hours every day. The availability of time for childcare has a significant impact on the development of children [4]. It was also reported that women's involvement in food production might have both beneficial and detrimental effects on child nutrition. Conversely, it can increase the overall quantity of food obtained, but it can also reduce the amount of time mothers have for childcare and feeding. Another study [5] found that the amount of time mothers spend engaged in farming activities was a significant contributing factor to the occurrence of stunting.

The Food and Agriculture Organization (FAO) reported that women in Tanzania spent 52% of their time on reproductive activities, while males spent 32% of their time on such activities [6]. Women allocate a greater amount of time than males to pre-cooking tasks, such as gathering firewood and water, as well as engaging in food preparation activities such as vegetable cutting, grain washing, cooking, and other household duties. Additionally, women also dedicate time to family care responsibilities [7, 8]. There is a favorable correlation between the amount of time women spend on domestic chores and cooking, and the diversity of their diets [9]. Consuming a varied diet enhances the nutritional status of children. A strong correlation between consuming a varied diet and a decrease in stunting, wasting, and being underweight in children was also reported elsewhere [10]. While engaging in domestic activities can contribute to a more varied diet and improve the nutritional condition of children, certain domestic chores might negatively affect child health. The limited availability of cooking fuel is a significant contributing factor to stunted growth [11]. Child undernutrition was found to be connected with factors such as the age and sex of the child. Age was identified as a decisive factor in the occurrence of stunting and being male was found to be associated with a higher likelihood of childhood [12, 13].

According to several Tanzanian studies, the influence of productive and reproductive roles of women on the nutritional status of children in various socioeconomic groups is still scant. To understand the influence of the productive and reproductive roles of women on the nutritional status of children, this paper aims to examine the risk factors of stunting (including women's productive and reproductive roles and other factors) of children aged 6–23 months among crop farmers and agro-pastoralists in Kilindi District.

2. Material and Methods

2.1. Study Areas

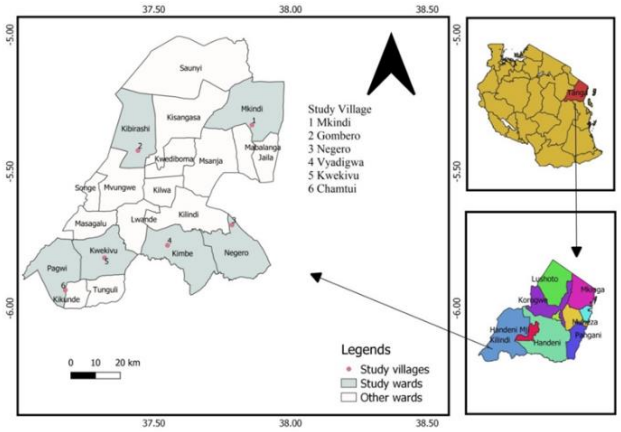

Figure 1. *Map of Tanzania showing the location of the study.*

2.2. Population and Sampling

The study was cross-sectional. This study design allows for quick data collection at a comparatively low cost. Children aged 6–23 months and their mothers or caretakers between 15–49 years old were included. Study participants were excluded if they were single-parent families, neither crop farmers nor agro-pastoralists, households with children under 6 months and above 23 months, not permanent residents of the village, and disabled children who might have complicated height and weight measurements.

2.3. Study Design and Population

The women to participate in this study were selected following a multistage sampling. Six wards (Negero, Kimbe, Kweikivu, Pagwi, Mkindi and Kiberashi) were selected based on ethnic groups, geographical location, crops and livestock farming activities. One village per ward whose majority of residents were crop farmers and agro-pastoralists was selected purposively. The lists of all eligible participants (crop farmers and agro-pastoralist households having children aged 6–23 months) were obtained from the sub-village chairpersons of

the selected six villages. Then, proportional stratified random sampling was used to obtain the random sample of 209 crop farmers and 136 agro-pastoralist households nested within the selected six villages (Negero, Vyadigwa, Kweikivu, Chamtui, Mkindi and Gombero B). One child was selected randomly in households with multiple children to avoid recall bias.

The sample size was estimated based on a formula z2 ×((p (100-p))/d2) [28] where z was 95% confidence level (standard value was 1.96). The prevalence of stunting in the Tanga Region (P) was 34% [27]. The percentage maximum error (d) was 5%. Therefore, the sample size required for this study was 345 households.

2.4. Data Collection

The data was gathered through in-person interviews utilizing a standardized questionnaire and anthropometric measures. Face-to-face interviews and anthropometric measurements were done at agreed gathering centers (schools and dispensaries). The questionnaire was formulated in English language based on study objectives and questions were translated into Swahili for easy administration and accuracy. The questionnaire used in the former study done by Shoo [12], was adopted and modified. Enumerators were trained before actual data collection.

The questionnaire was pre-tested in the pilot survey, which encompassed 10% of the sample size for households in a village that did not take part in the study. The aim was to check whether there were some missing questions and ambiguity. The questions were revised and adjusted based on the responses.

The information from mothers was collected using a structured questionnaire that included both open-ended and close-ended questions. The survey was utilized to gather data regarding the demographic attributes of households including women's involvement in farming in the 2019/20 and 2020/21 cropping seasons, and the allocated time for reproductive activities.

Weight was measured by weighing the child while wearing light clothes on a Salter Type Baby Weighing Scale, Maximum Capacity: 25 kg. Weight was recorded nearest to 0.1 kilograms (kg). For mothers who did not have a sling for hanging a baby on the scale, the weight of the child was measured together with her or his mother on the Seca digital weighing scale. Mother weighed first on the scale and weight was recorded, then the scale was set up to zero. The mother stood on the scale with a child on her arm, wearing light clothes. The weight of the mother together with her child was recorded, then subtracted from the weight of the mother. The measurements were taken a second time, and then the mean of the child's weight was recorded.

A length board (infantometer) was used to measure the length to the nearest 0.1 centimeters (cm). Child length was measured while laying down (recumbent), arm comfortably straight, flat on board, feet flat against foot piece, hand cupped over ears; head against the base of the board, and feet flat against foot piece.

2.5. Data Processing and Analysis

The data were verified, cleaned, encoded, and analyzed using the International Business Machines Corporation - Statistical Package for the Social Sciences (IBM SPSS) version 20. The World Health Organization (WHO) Anthro 3.2.1 program was utilized to convert measurements of weight, height, and age (in months) into corresponding values for weight-for-age, height-for-age, and weight-for-height. The study conducted a comparative analysis of demographic data between crop farmers and agro-pastoralists and examined the presence of statistically significant differences.

Significance was considered at 5% when $P<0.005$. Multivariate Ordinal logistic regression was used to determine risk factors of stunting. Chi-square was used to determine the relationship between women's involvement in maize farming and sales of maize produce in households and stunting.

3. Results

3.1. Household Characteristics

The demographic features of the households are shown in Table 1. A total of 345 households took part in the survey. Crop farmers accounted for 60.3% of the total, while agro-pastoralists accounted for 37.7%. The findings indicated that there was no statistically significant difference between the distributions of participants in surveyed wards (p=0.978), with the Mkindi ward accounting for the majority of study participants (26.4%). Female children made up 56.2% of all crop farmers' children and 50.4 % of all agro-pastoralists children. Crop farmers had 54.8 % of their households with children aged 6 to 12 months, while agro-pastoralists had 46.7%. Crop farmers and agro-pastoralists did not differ significantly in the sex and age distribution of their children (p=0.158 and 0.284, respectively). The age distribution of mothers among crop farmers and agro-pastoralists did not differ (p=0.75). Crop farmers group had 88.5% of mothers aged 15 to 35 years, while agro-pastoralists had 94.2%. About 66.7% of households were made up of one to five people.

3.2. Prevalence of Stunting

The prevalence of stunting was higher (54.5%) among crop farmers and agro-pastoralists (61.5%) in households that did not sell maize as a source of income in the 2019/20 cropping season (Table 2). The prevalence of stunting among households that did not sell maize as a source of income was high (54.5%) among crop farmers and 69.2% among agro-pastoralists in the cropping season of 2020/21 (Table 2). In the 2019/20 cropping season, the crop farmer

households whose women were involved in maize farming had a prevalence of stunting of 89.6% compared to agro-pastoralists (87.2%). In the 2020/21 cropping season, crop farmer households whose women were involved in maize farming had a prevalence of stunting of 92.2%, while agro-pastoralists had a prevalence of stunting of 94.9% (Table 2). There is no relationship between women's involvement in maize farming and sales of maize in households as a source of income and stunting among crop farmers and agro-pastoralists (Table 2).

3.3. Time Spent on Reproductive Roles as a Potential Risk Factor for Stunting

According to the findings from multivariate logistic regression (Table 3), time spent collecting firewood by crop farmer women was statistically significant at the 5% level of significance (P = 0.015) with the Odds Ratio (OR = 0.205, 95% CI, 0.057-0.738). In comparison to time spent between 1 and 5 hours per week, the results showed that crop farmer women who collected firewood between 11 and 15 hours per week had a 0.205 times lower risk of increasing prevalence of stunting, keeping other variables constant (Table 3).

Time spent by women on cooking per week among agro-pastoralists appears to be an important indicator of child nutritional status (OR = 0.153, 95% CI, 0.26-0.903). Keeping other covariates constant, the findings revealed a decreased probability of children being stunted as time spent on cooking between 21 and 30 hours per week increases, compared to 10–20 hours per week (Table 3).

Table 1. *Household demographic characteristics.*

Characteristics	Agro-Pastoralists (N=137, 37.7%) n (%)	Crop Farmers (N=208, 60.3%) n (%)	All (N=345) n (%)	P-value
Surveyed Ward				0.978
Kiberashi	7(5.1)	31(14.9)	38(11)	
Kimbe	13(9.5)	17(8.2)	30(8.7)	
Kweikivu	25(18.2)	38(18.3)	63(18.3)	
Mkindi	50(36.5)	41(19.7)	91(26.4)	
Negero	33(24.1)	43(20.7)	76(22)	
Pagwi	9(6.6)	38(18.3)	47(13.6)	
Age of mothers				0.75
15-35 Years	129(94.2)	184(88.5)	313(90.7)	
36-49 Years	8(5.8)	24(11.5)	32(9.3)	
Size of Household				0.120
1-5 People	98(71.5)	132(63.5)	230(66.7)	
6-10 People	39(28.5)	76(36.5)	115(33.3)	
Sex of children				0.284
Female	69(50.4)	117(56.2)	186(53.9)	
Male	68(49.6)	91(43.8)	159(46.1)	
Age of children				0.158
6-12 months	64(46.7)	114(54.8)	178(51.6)	
13-18 months	44(32.1)	57(27.4)	101(29.3)	
19-23 months	29(21.2)	37(17.8)	66(19.1)	
19-23 months	29(21.2)	37(17.8)	66(19.1)	

Mann Whitney U test, *Significant at p≤0.05

Table 2. *Prevalence of stunting in crop farmers and agro-pastoralists households.*

Variables	Crop Farmers			Agro-pastoralists		
	Stunting (below -2SD length for age Z score)			Stunting (below -2SD length for age Z score)		
	n	%	*P* Value	n	%	*P* Value
Women's involvement in maize farming in 2019/20			0.102			0.420
Yes (I have cultivated)	69	89.6		34	87.2	
No (I have not cultivated)	8	10.4		5	12.8	
Women's involvement in maize farming in 2020/21			0.091			0.059
Yes (I have cultivated)	71	92.2		37	94.9	
No (I have not cultivated)	6	7.8		2	5.1	
Maize produce sold as source of income in 2019/20			0.156			0.591
Household that sold maize produce	24	31.2		10	25.6	
Households whose women have not cultivated	8	10.4		5	12.8	
Households that have not sold maize produce	42	54.5		24	61.5	
Household whose women have cultivated, but I have not obtained produce.	1	1.3		0	0	
Households whose women don't remember what they sold	2	2.6				
Maize produce sold as source of income in 2020/21			0.150			0.269
Household that sold maize produce	30	39		9	23.1	
Households whose women have not cultivated	8	10.4		2	5.1	
Households that have not sold maize produce	37	48.1		27	69.2	
Household whose women have cultivated, but I have not obtained produce.	1	1.3		1	2.6	
Households whose women don't remember what they sold	1	1.3				

X^2 square: *Significant at p≤0.05

Table 3. *Time spent on reproductive roles as a potential risk factor for stunting (below -2SD length for age Z score) in children*

Variable	Crop Farmers					Agro-Pastoralists				
	Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR		Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR	
				Lower	Upper				Lower	Upper
Time spent on Fetching water per week										
10-20 Hours			1					1		
21-30 Hours	0.080	0.817	1.083	0.552	2.125	0.098	0.875	1.103	0.325	3.747
31-36 Hours	0.446	0.310	1.562	0.660	3.696	0.452	0.302	1.571	0.666	3.708

Variable	Crop Farmers					Agro-Pastoralists				
	Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR		Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR	
				Lower	Upper				Lower	Upper
Time spent on collecting firewood per week										
1-5 Hours			1					1		
6-10 Hours	-0.441	0.234	0.643	0.311	1.329	-0.918	0.250	0.399	0.84	1.910
11-15 Hours	-1.583	0.015*	0.205	0.057	0.738	-0.208	0.680	0.813	0.303	2.178
Time spend on cleaning house and environment per week										
1-6 Hours			1					1		
7-11 Hours	0.341	0.383	1.407	0.654	3.028	-0.304	0.523	0.738	0.290	1.877
Taking care of children										
7-15 Hours			1					1		
16-25 Hours	-0.629	0.069	0.533	0.271	1.051	0.269	0.528	1.308	0.568	3.015
Time spent on cooking per week										
10-20 Hours			1					1		
21-30 Hours	0.015	0.982	1.015	0.274	3.759	-1.877	0.038*	0.153	0.26	0.903
31-42 Hours	0.397	0.548	1.487	0.407	5.430	-1.681	0.57	0.186	0.033	1.051

Crop farmers: Modal is significant at (p=0.004), Pseudo R2=0.186, Goodness of fit test for overall: Deviance= 0.950 *Significant at p≤0.05
Agro-Pastoralists: Modal is significant at (p=0.000), Pseudo R2=0.348, Goodness of fit test for overall: Deviance= 0.929 *Significant at p≤0.05

3.4. Other Risk Factors for Stunting

Keeping other variables constant, the results from crop farmers revealed that being male increased the likelihood of stunting by 2.601 times compared to being female (OR = 2.601, 95% CI; 1.302, 5.196). Children aged 13-18 months (OR = 2.820, 95% CI; 1.295, 6.143) and 19-23 months (OR= 4.999, 95% CI; 1.829, 13.664) had an increased likelihood of stunting by 2.820 and 4.999 times respectively compared to children aged 6-12 months. Mothers with no formal education had an increased likelihood of stunting by 2.212 times compared to mothers with primary education (OR = 2.212, 95% CI; 1.019, 4.799) (Table 4). Crop farmers households that did not sell maize produce as a source of income had a 0.276 times lower risk of increasing likelihood of stunting in cropping season 2020/21, keeping other variables constant (OR = 0.276, 95% CI, 0.096-0.795, *p*=0.017) (Table 4).

The geographical locations of crop farmers (Mkindi and Negero wards) were statistically significant at the 5% level of significance (P = 0.007 and P = 0.020, respectively). The estimated odd ratio (OR = 0.169, 95% CI, 0.046-0.615 for Mkindi and OR = 0.020, 95% CI, 0.062-0.792 for Negero). In comparison to the Kiberashi ward, the results showed that geographical location (Mkindi and Negara wards) had a lower risk of increasing the likelihood of stunting while keeping other variables constant (Table 4).

The geographical locations (Kimbe, Mkindi, and Negero wards) where agro-pastoralists reside were statistically significant at the 5% level of significance (P = 0.001, P = 0.01, and P = 0.028 respectively). The estimated odd ratio (OR = 0.004, 95% CI, 0-0.115 for Kimbe, OR = 0.061, 95% CI, 0.007-0.518 for Mkindi, and OR = 0.055, 95% CI, 0.004-0.725 for Negero). In comparison to the Kiberashi ward, the results showed that geographical location (Kimbe, Mkindi, and Negero ward) had a lower risk of increasing the likelihood of stunting while keeping other variables constant (Table 4).

4. Discussion

Both crop farmers and agro-pastoralist households with mothers engaged in maize farming exhibited a nearly identical elevated prevalence of stunting. As a result of a significant amount of work, certain mothers carry their children to the agricultural fields and feed them with uji (a thin porridge) made solely from maize flour and little breastmilk. In contrast, other mothers left their children at home with their siblings, and the children spent the entire day at home consuming thin porridge and eating wheat buns (mandazi) without sufficient supervision. It was discovered that a significant proportion of women (60.6%) took their young children to the farming fields. Furthermore, it was reported that 86.7% of children under the age of 2 who were taken to the field were mostly fed porridge [5]. This may lead to insufficient food consumption, which in turn leads to stunted growth. Women who exerted the greatest effort in their work in the fields were more prone to having children who suffered from malnutrition [12].

The prevalence of stunting was greater among agro-pastoralists compared to crop farmers in households that did not generate income from selling maize. Households that did not generate income by selling maize had low productivity in maize cultivation, and the majority of these households had a large family size. Agro-pastoralist women, unlike crop farmers, face a significant disparity in terms of access to and control over food stores and other family resources that might be utilized for obtaining food or buying it. Additionally, they do not have access to finance to initiate small enterprises, which would provide cash to purchase food for their children. Food accessibility refers to the state in which households and individuals possess sufficient means to acquire suitable foods that contribute to a nourishing diet [14]. Insufficient consumption of food can lead to child malnutrition [15].

Table 4. *Other risk factors of stunting (below -2SD length for age Z score) among children aged 6-23 months.*

Variable	Crop Farmers					Agro-Pastoralists				
	Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR		Regression Coefficient	P-Value	EXP(B) OR	95% CI for OR	
				Lower	Upper				Lower	Upper
Geographical Location										
Kiberashi			1					1		
Kimbe	0.106	0.020	0.899	0.203	3.980	-5.587	0.001*	0.004	0	0.115
Kweikivu	-0.614	0.412	0.598	0.175	2.043	-1.236	0.255	0.291	0.035	2.435
Mkindi	-1.780	0.007*	0.169	0.046	0.615	-2.799	0.01*	0.061	0.007	0.515
Negero	-1.506	0.020*	0.222	0.062	0.792	-2.9	0.028*	0.055	0.004	0.725
Pagwi	-0.061	0.916	0.940	0.301	2.934	-2.08	0.138	0.125	0.008	1.952
Sex of children										
Female			1					1		
Male	0.956	0.007*	2.601	1.302	5.196	0.141	0.783	1.151	0.422	3.142
Age of children										
6-12 months			1					1		
13-18 months	1.037	0.009*	2.820	1.295	6.143	-0.112	0.89	0.894	0.184	4.341
19-23 months	1.609	0.002*	4.999	1.829	13.664	0.471	0.411	1.601	0.521	4.916
Level of education of the mother										
Primary Education			1					1		
Secondary education	-0.123	0.881	0.885	0.176	4.438	-19.051	1	5.33E-09	0	
No Formal Education	0.794	0.045*	2.212	1.019	4.799	0.831	0.17	2.296	0.7	7.535
Not completed sec-						-0.673	0.695	0.51	0.018	14.814

Variable	Crop Farmers					Agro-Pastoralists				
	Regression Coefficient	**P-Value**	**EXP(B) OR**	**95% CI for OR**		**Regression Coefficient**	**P-Value**	**EXP(B) OR**	**95% CI for OR**	
				Lower	**Upper**				**Lower**	**Upper**
ondary education										
Not completed primary education	-19.355	1	3.93E-09	0.000		-20.372	1	1.42E-09	0	
Income generated as a result of selling maize in 2020/21 cropping season										
I don't remember			1				1			
I have cultivated but I have not obtained produce	-1.532	0.137	0.216	0.029	1.627	0.546	0.709	1.726	0.098	30.364
They have not sold produce in the household	-1.288	0.017*	0.276	0.096	0.795	0.085	0.925	1.088	0.185	6.421
I have not cultivated			1			1	2.42E-09	0.000	-19.838	1
I have sold some of the produce and I have obtained income	21.192	1.000	6.259E-010	0.00	-19.838					

Crop farmers: p=0.000), R2=0.194, F= 3.927 *Significant at p≤0.05
Agro-Pastoralists: p=0.402), R2=0.094, F=1.058 *Significant at p≤0.05

Female crop farmers who gathered firewood for 11 to 15 hours per week had a 0.205 times reduced risk of causing stunting in children aged 6-23 months. In other areas, it was also reported that limited access to cooking fuel is a significant factor contributing to stunting [11]. Among agro-pastoralists, research has shown that there is a lower likelihood of children experiencing stunted growth when women spend more time cooking. Time between 21 and 30 hours per week, compared to spending 10-20 hours per week. There is a favourable correlation between the amount of time women spend on domestic chores and cooking, and the diversity of their diets [9]. Women in Bangladesh and Cambodia who dedicated more time to cooking had a wider variety of meals. This trend is also observed among impoverished women [16] where dedicating time to cooking at home was shown to be essential for developing healthy eating habits. Adhering to a nutritious diet throughout one's lifespan aids in the prevention of malnutrition in all its manifestations, as well as a variety of non-communicable diseases and ailments that are influenced by food [17].

Furthermore, within the group of crop farmers, children between the ages of 13-18 months and 19-23 months were shown to have a significantly higher risk of stunting, with 2.820 and 4.999 times greater chances respectively, compared to children aged 6-12 months. Similar outcomes were also seen in Asian countries, indicating that children older than 12 months had a higher likelihood of experiencing stunting [20]. The eldest child is typically entrusted to the care of elder siblings or relatives at home, resulting in a diminished level of attention and care [13].

However, among the crop farming group, being male was associated with a 2.601 times higher chance of stunting compared to being female. This is a higher rise than what was reported by another study [18] that being male raised the likelihood of stunting by 1.71 times compared to being female. Similar results were found in Ethiopia [12], stating that being male increased the likelihood of childhood stunting. It was also reported that boys were identified as important independent factors that predict childhood stunting [19]. In Asia, male children had a higher likelihood of experiencing stunted growth compared to female children, with an adjusted odds ratio (AOR) of 1.22 and a 95% confidence interval (CI) of 1.08 to 1.39 [20]. The sex disparities in the likelihood of stunting can be attributed to variations in complementary feeding methods, biological dissimilarities, cultural factors, and differential susceptibility to infectious diseases. Sex disparities in nutritional health may also be attributed to inherent biological distinctions that are unrelated to patterns of

baby feeding, such as vulnerability to viral illnesses [21].

Women who lack formal education had a 2.212 times higher chance of having stunted children aged 6-23 months in crop farming communities, compared to women who had completed primary education. Similar results were reported in other studies [19, 22]. Additionally, most of these mothers belong to low-income families who do not have enough food to adequately nourish their infants.

Households of crop producers who did not sell maize as a source of revenue had a reduced risk of experiencing an increase in the chance of stunting during the 2020/21 cropping season. Households that did not generate income by selling maize had many family members and low to moderate levels of maize productivity. The majority of these households engaged in small-scale entrepreneurship activities, home gardening, and informal labor to meet family expenses, including the purchase of a variety of foods. Food accessibility refers to the state in which households and individuals possess sufficient means to acquire suitable foods that contribute to a nourishing diet [14]. Young children, namely those under the age of five, are the most susceptible and are the first to experience negative impacts when the food security situation deteriorates [11]. Families with moderate food insecurity were found to have a greater likelihood of experiencing stunted growth compared to children living in households with food security [23].

Regarding crop farmers, residing in Mkindi and Negero wards was associated with a reduced risk of stunting. Similarly, agro-pastoralists, residing in Kimbe, Mkindi, and Negara wards had a lower risk of stunting compared to the Kiberashi ward. The surveyed wards (Kimbe, Mkindi, and Negero) cultivate a diverse range of crops including maize, paddy, sunflower, beans, horticultural crops, and fruits. Additionally, they keep a significant number of livestock such as cattle, goats, and sheep. This agricultural diversity contributes to improved household food security, reducing the probability of stunting. Other studies also reported better child nutritional status in comparison to sites of living and geopolitical zones [24-26]. The variability of results can also be attributed to disparities in the research location, methods of data collection, and methodologies employed for analysis.

5. Conclusions

Children's age, gender, and mother's level of education all increased the likelihood of child stunting among crop farmers. Cooking time (21-30 hours per week) among agro-pastoralists and collection of firewood (11-15 hours per week) among crop farmers had a lower risk of increasing the likelihood of stunting. Nutritional interventions should address maternal education, proper child care, and feeding practices.

Abbreviations

FAO	Food and Agriculture Organization
OR	Odds Ratio
WHO	World Health Oranization

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Author Contributions

Mtagulwa Mzee Hillary: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing

Hadijah Ally Mbwana: Data curation, Methodology, Supervision, Validation, Visualization, Writing – review & editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

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