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Research

Effect of a community-based intervention on child nutritional status in Rimi Ward, Kano State, Nigeria

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Background

Suboptimal infant and young child feeding practices significantly contribute to poor child nutritional status, particularly in low-income settings like Nigeria, where high prevalences of undernutrition, including stunting, wasting, and underweight, persist (WHO, 2021; NDHS, 2023). Community-based interventions are crucial for improving nutritional outcomes.

Objective

This study evaluates the effect of a community-based intervention, comprising nutrition education, home gardening, and small-scale animal rearing, on the nutritional status of children aged 6-59 months in Rimi Ward, Sumaila LGA, Kano State, Nigeria.

Methods

A quasi-experimental study design was employed to assess weight-for-height Z-score (WFH Z-score) and mid-upper arm circumference (MUAC) at baseline and endline after a 6-month intervention period for a cohort of 148 children aged 6-59 months. A multi-stage sampling technique was used; Rimi Ward was purposively selected for its high malnutrition burden. Four community volunteers were recruited and trained for three days to assist with anthropometric measurements (weight, height/length, and MUAC) during baseline and endline data collection. After the baseline assessment, a six-month community-based intervention comprising nutrition education, home gardening, and goat and poultry rearing was implemented. Paired samples t-test was used to determine significant changes in mean WFH Z-score, and Stuart Maxwell tests were used to assess changes in WFH Z-score and MUAC nutritional status categories.

Results

The socio-demographic profile showed that most caregivers of these children (51.4%) were young mothers aged 16–25 years, with no formal education (59.5%). Most were self-employed or unemployed and incomes were low. The intervention led to significant improvements in child nutritional status. The prevalence of moderate wasting (14.2% to 5.4%) and severe wasting (7.4% to 0.7%) decreased substantially. Similarly, MUAC showed marked reductions in severe acute malnutrition (6.1% to 0%) and moderate acute malnutrition (6.8% to 1.4%), with a corresponding increase in normal nutritional status (87.2% to 98.7% of children) ($p < 0.001$).

Conclusions

These findings highlight the potential of integrated, community-led programs to address child undernutrition in similar resource-constrained environments. Policymakers should consider scaling up such models by embedding nutrition education, home gardening, and livestock rearing into existing primary health and community agricultural systems to achieve sustainable improvements in child nutrition.

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INTRODUCTION

Child undernutrition, manifested as stunting (low height-for-age), wasting (low weight-for-height), and underweight (low weight-for-age), remains a critical global health challenge, particularly prevalent in low- and middle-income countries (LMICs) (WHO, 2021; Victora et al. 2021). Globally, an estimated 149 million children under five are stunted, 45 million are wasted, and 37 million are overweight (WHO, 2022). These forms of malnutrition contribute significantly to childhood morbidity, mortality, and long-term developmental impairments, impacting cognitive function, physical growth, and overall human capital development (Black et al. 2013).

In Nigeria, the burden of child undernutrition is particularly high. The 2023 National Demographic and Health Survey (NDHS) reported that 40% of children under the age of five are stunted, 27% are wasted, and 10% are underweight (FMoHSW, NPC, and ICF, 2025). Kano State, a densely populated region in Northern Nigeria, faces significant challenges in child nutrition, where suboptimal infant and young child feeding (IYCF) practices, coupled with endemic poverty and food insecurity, continue to drive these high rates (UNICEF, 2020; NDHS, 2023). Wasting and acute malnutrition, as indicated by mid-upper arm circumference (MUAC), are immediate indicators of acute nutritional deficit, often linked to recent illness or inadequate food intake, and are associated with increased risk of mortality (Black et al. 2013).

Appropriate IYCF practices, comprising optimal breastfeeding and complementary feeding, play crucial roles in preventing and addressing undernutrition. Specifically, appropriate breastfeeding is associated with a lower prevalence of childhood diarrhoea (Victoria et al. 2016; UNICEF, 2021a), upper respiratory tract infections, and childhood obesity, as well as reduced risks of maternal diseases like diabetes mellitus (Victora et al. 2016). Additionally, appropriate complementary feeding is associated with a reduced risk of undernutrition (i.e., underweight, stunting, and/or wasting) (Black et al. 2013). Despite these well-documented benefits, many LMICs, including regions within Nigeria, still report a higher prevalence of inappropriate IYCF practices (UNICEF, 2021a; UNICEF, 2021b; NDHS, 2023; WHO, 2021; Victora et al. 2021). Moreover, feeding practices in Kano State continue to remain suboptimal. According to the NDHS, only 19.3% of children aged 6–23 months meet the minimum dietary diversity, and 10.1% achieve the minimum acceptable diet (NDHS, 2018). These figures fall below national averages and underscore the urgent need for interventions to improve feeding practices among children aged 6–59 months.

Community-based interventions have emerged as a promising strategy to address the multifaceted causes of malnutrition by delivering integrated nutrition-sensitive and nutrition-specific interventions at the household and community levels (Ruel & Alderman, 2013; Olney et al. 2016). These interventions often combine nutrition education, promotion of diversified diets through home gardening, and small-scale animal rearing to improve food security and dietary quality (Jaenicke & Virchow, 2013; Masset et al. 2012). In the present case, these interventions were specifically chosen because they are locally appropriate, culturally acceptable, and sustainable in rural Kano. However, the impact of such interventions has rarely been evaluated. This study aims to evaluate the effectiveness of a comprehensive community-based intervention implemented in Rimi Ward, Sumaila LGA, Kano State, Nigeria, on the nutritional status of children aged 6-59 months.

METHODS

STUDY DESIGN

This study employed a quasi-experimental, pre- and post-intervention design with no comparison group to assess the impact of a community-based intervention on children's nutritional status. Anthropometric data were collected at baseline and after a 6-month intervention period.

STUDY LOCATION AND SAMPLE

The intervention was implemented in Rimi Ward of Sumaila Local Government Area (LGA), Kano State, Nigeria. A cohort of 148 children aged 6-59 months participated in the study, with their nutritional status assessed at both baseline and endline. All 148 caregiver–child pairs completed the endline assessment, resulting in no attrition. The caregiver–child pairs were drawn from the six communities within Rimi Ward: Rimi Arewa, Rimi Gabas, Rimi Central, Rimi Kudu, Rimi Yamma, and Sabon Garawa. Caregivers of these children were required to have resided in the community for at least six months prior to the study and to intend to remain throughout the study period.

SAMPLING PROCEDURE

A multi-stage sampling technique was employed to select the child-caregiver pairs included in this study. A total of 160 households were approached, from which 148 eligible caregiver-child dyads were recruited, giving a sampling yield of 92.5%. The remaining 12 households were not enrolled because they did not meet the eligibility criteria: absence of a child aged 6–59 months, declined participation, or were unavailable at the time of data collection. The aim was to ensure a fair and representative selection of participants across all six communities in Rimi Ward, Sumaila Local Government Area, Kano State.

STAGE 1: Rimi ward was purposefully selected for its high burden of malnutrition (as reported in local PHC data) and its agrarian characteristics.

STAGE 2: The ward was stratified into six communities based on existing immunization intervention coverage: Rimi Arewa, Rimi Gabas, Rimi Central, Rimi Kudu, Rimi Yamma, and Sabon Garawa.

STAGE 3: Within each community, a list of all households was developed with the support of the community leaders. Every fifth household was chosen using systematic random sampling.

STAGE 4: In each selected household, a screening process was used to identify whether a caregiver had at least one child aged 6–59 months. If multiple eligible children were present, the youngest was selected. In households with more than one eligible caregiver, one was randomly chosen. Only one caregiver–child pair was included per household. If no eligible participant was identified or the caregiver declined participation, the next household on the list was visited as a replacement.

INTERVENTION

The community-based intervention was implemented for six months (September 2024 to February 2025). Table 1 summarizes the key components and duration of each activity conducted during the intervention period:

Table 1: Summary of Interventions and Implementation Timeline

S/N	Components	Number of days
1	Market Survey	1 day
2	Nutrition Education	5 days
3	Food Demonstration (including soymilk preparation)	2 days
4	Home Gardening and Animal Rearing Training	2 days
5	Distribution of seeds, pesticides, chicks, and goats	1 day
6	Monitoring and Support	Monthly for 5 months

COMMUNITY ENGAGEMENT

Prior to intervention, an advocacy visit was conducted to engage key stakeholders: ward head, community leaders, religious leaders (imam and pastor), representatives from the National Population Commission, the women's support group, and the person in charge of the Rimi Primary Health Centre. A town hall meeting followed with caregivers of 6–59-month-old children. A focal person was appointed from each community to oversee the project locally.

NUTRITION EDUCATION

A five-day education session on age-appropriate child feeding practices was conducted for caregivers. Topics covered included exclusive and continued breastfeeding, complementary feeding, meal frequency, dietary diversity, and the concept of the five-star diet. The training was delivered in Hausa, the primary language understood by the caregivers. Facilitators used a manual adapted from the 2023 Nigeria Maternal, Infant, and Young Child Nutrition Training Guide. For participants, a visual manual was developed using illustrations from the UNICEF IYCF Image Bank to simplify concepts through clear images and practical demonstrations, making them easy to understand regardless of literacy level.

FOOD DEMONSTRATION

Two days were dedicated to food demonstrations following a one-day market survey conducted immediately after the baseline assessment. The survey aimed to identify underutilized but locally available nutritious food ingredients in the community markets. Findings revealed that pumpkin, though widely available in the community, was only used for soup. As a result, caregivers were taught alternative ways to incorporate pumpkin into complementary foods such as pap and porridge to increase dietary diversity and enhance vitamin A intake. The participants were also divided into six groups and tasked with selecting ingredients from a mock food market categorized into seven food groups: grains, legumes, dairy, flesh foods, eggs, vitamin A-rich fruits/vegetables, and other fruits/vegetables. They prepared nutrient-dense, age-appropriate complementary meals, emphasizing proper consistency and hygiene practices. Soybean was also found to be available in the community market and was primarily used to make deep-fried tofu. The caregivers were taught how to process soybeans into powdered soymilk, store it, and use it to enrich children's meals over a two-day practical session. Each caregiver received two local measures (mudu) of soybeans to produce soymilk at home as a practical, low-cost protein supplement for child feeding.

HOME GARDENING AND ANIMAL REARING

A two-day training on home gardening and animal rearing was conducted. Caregivers were trained on how to grow spinach, sweet potatoes, tomatoes, and bell peppers at home. They were also provided training on poultry and goat rearing. Immediately after training, seeds and pesticide were distributed to all the caregivers. Poultry was given to most households because it requires less space and is less costly, while goats were allocated only to households with the resources to manage them effectively.

Households were assessed against predefined criteria, including availability of space and capacity to provide feed, to ensure that each household received the livestock option they could realistically maintain in the long run. Of the 148 households deemed satisfactory, 25 were randomly selected to receive 3 goats (1 male, 2 females). The other 123 received poultry (1 hen, 2 chicks).

ONGOING MONITORING

Monthly visits over five months were conducted by the research team and an agricultural extension officer to observe the home garden setup, the condition of the provided animals, and the use of recipes, including soymilk powder, in child feeding.

DATA COLLECTION

Baseline and endline data were collected to assess the effect of the integrated community intervention on child nutritional status. The interval between the baseline and endline was nine months. The same children were measured at baseline and endline. Children who exceeded 59 months during follow-up remained in the study.

ANTHROPOMETRIC MEASUREMENTS

Standardized WHO-recommended instruments and procedures were used: child weight was measured to the nearest 0.1kg using a digital weighing scale (SECA 874). For the height measurement, recumbent length was measured for children under 24 months and standing height for those older. Mid-upper-arm circumference (MUAC) was measured for all children using a color-coded Shakir's strip.

NUTRITIONAL STATUS CLASSIFICATION

Weight for height (WFH) Z-scores were calculated using WHO Anthro software and classified into severe wasting (<−3 SD), moderate wasting (−3 SD to <−2 SD), normal (−2 SD to +1 SD), overweight (>+1 SD to +2 SD), and obesity (>+2 SD). MUAC was classified into Red (<11.5 cm, severe acute malnutrition), Yellow (11.5 cm to <12.5 cm, moderate acute malnutrition), and Green (⩾12.5 cm, normal nutritional status). Classifications for WFH Z-scores and MUAC were done separately for each indicator.

STATISTICAL ANALYSIS

Data were analysed using SPSS. Paired sample t-tests

compared mean WFH Z-scores at baseline and endline. Stuart Maxwell tests assessed the significance of changes in MUAC and Z-score categories. Frequencies and percentages described variable distributions. Statistical significance was set at $p < 0.05$, and all tests were two-tailed.

RESULTS AND DISCUSSION

All 148 caregiver–child pairs completed both baseline and endline assessments, with no dropouts or missing data. The intervention's impact on child nutritional status was assessed by comparing WFH Z-score and MUAC indicators at baseline and endline.

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

Table 2 presents the baseline socio-demographic characteristics of the children and their caregivers who participated in the study (N=148). Most children (42.6%) were aged 24 to 59 months, with a slight majority being female (53.4%). Almost all deliveries were vaginal (99.3%). The majority of mothers were young (51.4% aged 16-25 years), married (98.7%), and nearly half were currently breastfeeding (47.3%). A significant proportion of mothers had no formal education (59.5%) and were self-employed (67.5%), with 35.1% reporting no monthly income. For fathers, the majority were traders (66.9%) and had no formal education (39.9%). A substantial portion (82.4%) of caregivers (all female) reported not knowing the average monthly income of fathers. This may reflect cultural norms that restrict women's access to household financial information, which in turn may limit their ability to make informed decisions about child nutrition and health. Evidence from the 2018 Nigeria Demographic and Health Survey shows that about half of mothers (50.4%) had low involvement in household decision-making, 37.2% had low financial control, and 41.6% had limited mobility, underscoring the persistent influence of gendered power dynamics on maternal autonomy in Nigeria (Ariyo & Jiang, 2022).

Table 2: Socio-demographic characteristics of children and caregivers at baseline (N=148)

Characteristics	Categories	Frequency (n)	Percentage (%)
Child characteristics			
Age of child (months)	6 to 11	39	26.3
	12 to 23	46	31.1
	24 to 59	63	42.6
Gender of child	Male	69	46.6
	Female	79	53.4
Mode of delivery	Vaginal delivery	147	99.3
	C-section	1	0.7
Caregiver characteristics			
Age (years)	16 to 25	76	51.4
	26 to 35	56	37.8
	36 to 49	16	10.8
Marital status	Married	146	98.7
	Widow	2	1.3
Physiological status	Pregnant	45	30.4
	Lactating	70	47.3
	Non-lactating	33	22.3
Educational status	No formal education	88	59.5
	Primary	31	20.9
	Junior secondary	14	9.5
	Senior secondary	12	8.1
	Tertiary	3	2.0
Occupation	Civil servant	1	0.7
	Self employed	100	67.5
	Unemployed	45	30.4
	Farmer	2	1.4
Monthly income (₦)*	Less than 2,000	49	33.1
	2,000 – 5,000	33	22.3
	5,001 – 10,000	12	8.1
	More than 10,000	2	1.4
	Don't Earn	52	35.1
Fathers' characteristics			
Educational status	No formal education	59	39.9
	Primary	34	23.0
	Secondary	32	21.6
	Tertiary	23	15.5
Occupation	Civil servant	13	8.8
	Farmer	35	23.6
	Trader	99	66.9
	Unemployed	1	0.7
Number of wife/wives	1	78	52.7
	2	56	37.8
	3	10	6.8
	4	4	2.7

*1 US $ ~ 1600 ₦ at the time of the survey

INTERMEDIATE INTERVENTION OUTCOMES

Of the 148 caregivers, nearly all planted at least one of the five crops: tomato (90.5%), red pepper (81.8%), sweet pepper (8.1%), amaranth (91.2%), and potato (52.7%). 66.7% had harvested produce from their gardens at endline, nearly two-thirds (64.9%) perceived an improvement in household access to nutritious foods, and the majority (64.9%) reported using that harvested produce to prepare a family meal.

Regarding poultry production, more than half of the women (57.7%) owned between one and five chickens, while 15.4% owned six or more chickens at endline. The majority (61.8%) reported that their hens had commenced egg laying, and 63.4% had collected eggs from their chickens. In addition, 61.0% of the hens had hatched eggs.

Among the 25 women who received goats, all (100%) retained ownership of at least two goats at follow-up. Most (72.0%) reported having at least one pregnant goat, and all caregivers indicated that their goats were in good health (64.0% rated as excellent, 32.0% as good, and 4.0% as fair).

EFFECT ON WEIGHT-FOR-HEIGHT Z-SCORE

Table 3 summarizes the changes in nutritional status that occurred from baseline to endline. It shows that, at baseline, 21 children (14.2%) were moderately wasted and 11 children (7.4%) were severely wasted. Following the intervention, these numbers significantly declined to 8 children (5.4%) with moderate wasting and one child (0.7%) with severe wasting. Correspondingly, the number of children with normal WFH Z-scores increased from 114 (77.0%) at baseline to 139 (93.9%) at endline.

The Stuart Maxwell test indicated a statistically significant change in the distribution of children across WFH Z-score categories from baseline to endline ($chi2=29.4$, p-value <0.001).

A paired samples t-test also revealed a statistically significant improvement in the mean WFH Z-score. The

mean WFH Z-score increased from -0.95 (SD = 1.38) at baseline to -0.26 (SD = 1.22) at endline (t(147)=4.79, p-value <0.001).

EFFECT ON MID-UPPER ARM CIRCUMFERENCE (MUAC)

At baseline, 19 children (12.9%) were classified with acute malnutrition; children (6.1%) had severe acute malnutrition, while 10 children (6.8%) had moderate acute malnutrition. At endline, there were no children with severe acute malnutrition, and two children (1.4%) with moderate acute malnutrition. The number of children with normal MUAC increased from 129 (87.2%) at baseline to 146 (98.6%) at endline. Overall, 17 children (11.5%) who were previously malnourished became normal, while two children (1.4%) shifted from severe to moderate acute malnutrition. This represents a marked reduction in the overall prevalence of acute malnutrition from 12.9% at baseline to 1.4% at endline, likely due to the effectiveness of the intervention. The Stuart Maxwell test indicated a statistically significant change in the distribution of children across MUAC categories from baseline to endline (chi2=29.6, p-value <0.001).

It is possible that the nutrition education and food demonstrations contributed to the improvements in the children's nutritional status. These activities promoted better feeding practices, which may have led to quicker weight gain and MUAC than home gardening and animal rearing, which generally take longer to affect nutritional outcomes. This interpretation aligns with evidence that behaviour change interventions targeting IYCF often produce faster improvements in child anthropometric outcomes, whereas agricultural interventions typically require more extended implementation periods to demonstrate measurable nutritional impacts (Ruel & Alderman, 2013; Girard et al. 2012). However, we did not measure changes in IYCF practices.

Table 3: Changes in nutritional status of children (6–59 months) at baseline and endline

Variables	Category	Baseline (%)	Endline (%)	Chi^2	p-value
Weight-for-Height (WHZ)	Overweight	2(1.4%)	0(0.0%)	31.4	0.0000
	Normal	114(77.0%)	139(93.9%)		
	Moderate wasting	21(14.2%)	8(5.4%)		
	Severe wasting	11(7.4%)	1(0.7%)		
MUAC	Green (Normal)	129(87.2%)	146(98.6%)	29.6	0.0000
	Yellow (MAM)	10(6.8%)	2(1.4%)		
	Red (SAM)	9(6.1%)	0 (0%)		

Our findings align with those from other integrated nutrition programs that have demonstrated positive impacts on wasting by improving food intake and reducing disease burdens (Olney et al. 2016). The present study also builds on previous evidence from soybean utilization programs in northern Nigeria, which demonstrated improved child nutrition following training in soymilk production (Kormawa et al. 2018), and livestock-based interventions in Africa that enhanced household access to animal-source foods (Alemu et al. 2023). In addition, a meta-analysis of nutrition-sensitive agriculture programs reported significant improvements in children's dietary diversity and increased likelihood of meeting minimum dietary diversity, highlighting diet quality as a key pathway linking agriculture-based interventions to reductions in undernutrition (Margolies et al. 2022). Similar benefits have also been documented in livestock-focused interventions across Africa, which increased consumption of animal-source foods and improved child dietary outcomes (Muema et al. 2023). By combining nutrition education, home gardening, and small livestock rearing, the intervention provided a culturally appropriate and sustainable model for improving child nutrition.

LIMITATION OF STUDY

The intervention was implemented in one ward within the Rimi local government area, which limits how far the findings can be generalized. The absence of a control or comparison group also means that the observed improvements cannot be attributed solely to the intervention, as secular changes or seasonal patterns may also have influenced children's nutritional status.

CONCLUSION

The community-based intervention implemented in Rimi Ward, Kano State appeared to have a significant positive effect on the nutritional status of children aged 6-59 months. There was a substantial reduction in the prevalence of moderate and severe wasting (WFH Z-score) and acute malnutrition (MUAC categories), with a significant improvement in mean WFH Z-score. These findings provide evidence for the effectiveness of integrated nutrition education, home gardening, and small-scale animal rearing programs in combating child undernutrition. However, while the short-term effects are promising, longer-term follow-up is needed to assess the sustainability of these nutritional gains and to capture the delayed impact of agricultural components such as home gardening and animal rearing.

Future efforts should focus on scaling up such multi-sectoral approaches to achieve sustainable improvements in child health and nutrition across similar vulnerable populations. Additionally, integrating these interventions into local primary health care systems and existing agricultural and community nutrition programs could strengthen their impact and ensure broader, more sustainable benefits.

AUTHOR CONTRIBUTIONS

SMA, AMG, HSG, DUI, and KI contributed to the conceptualization, overall study design, and provided supervision. SMA, AMG, HSG, KI, SS, AAA, and DUI contributed to the methodology. SS, AAA, AS, and EKC conducted the investigation and field data collection, data curation, data analysis, and visualization of results. SS wrote the original draft of the manuscript, while SMA contributed to the final draft and submission of the manuscript. All

authors have read and approved the final version for publication.

CONFLICT OF INTEREST
The authors declare that they have no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN SCIENTIFIC WRITING
Nothing to disclose.

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