

The Effect Of Enhanced Nutrition And Value Chains (ENVAC) Project On Dietary Diversity And Nutritional Status Of Women And Children In The Sagnarigu Municipality

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Abstract: Introduction: Stunting prevalence is high in the Northern Region of Ghana, and Sagnarigu Municipality is one of the districts with high rates of stunting in spite of several efforts targeted at stunting prevention in the region. The objective of this study was to investigate the influence of Enhanced Nutrition and Value Chains (ENVAC) Project, a stunting prevention programme on dietary diversity of women and their children, and the nutritional status of children (beneficiary and non-beneficiary) under 24 months in the Sagnarigu Municipality.

Methods: The study was carried out in the Sagnarigu Municipality, involving beneficiaries and non-beneficiaries of the ENVAC Project in the Municipality. Data was collected using anthropometric measurements and an interviewer-administered structured questionnaire on 442 respondents who were selected using a multi-stage selection procedure, employing a comparative cross-sectional study design.

Results: The mean dietary diversity score (DDS) was 3.69 ± 1.71 with 40.6 % of the children meeting the minimum dietary diversity score of five or more food groups (≥ 5 food groups). Beneficiary children consumed much more grains, roots, and tubers, as well as meat and other fruits and vegetables compared to the non-beneficiary children. However, the frequency of consuming nutrient dense foods such as dairy products, eggs, legumes & nuts, milk, and fruits and vegetables was not different between the beneficiaries and non-beneficiaries. There was no difference in the mothers' dietary diversity in the research.

Conclusion: The intervention was linked to an increase in Length-for-age Z-scores (LAZ), particularly in children who ate the GrowNuts food supplements.

I. INTRODUCTION

Enhanced Nutrition and Value Chains (ENVAC) is a 5-year project initiated in 2016 by the Canadian government, with the objective of eliminating stunting and micronutrient deficiencies (WFP 2017). Integrated into the World Food Country Programme in 2016, ENVAC operates as an integrated nutrition and agriculture project, (Tandoh 2018), with a particular focus on stunting prevention (WFP 2018). It commenced in 2017, concentrating efforts on districts with the highest stunting rates in Ghana's northern region, including Sagnarigu, Central Gonja, Chereponi, East Mamprusi, Yendi, Zabzugu, and Gushiegu (WFP 2019).

Ghana, with an estimated population of 28.2 million, faces challenges of high poverty rates (21.4 percent) and persistent stunting, especially in the Northern Savannah Ecological Zone (GSS 2021); (WFP 2019). Despite progress in reducing acute malnutrition and stunting nationally, the country has made limited headway in addressing stunting, with rates at 19% nationally and 33% in the northern region (Ghana Statistical Service 2015). Sagnarigu Municipality reports the highest percentage of stunted children at 47.6% (USAID 2017).

Globally, stunting affects approximately 162 million children under 5 years, with the World Health Organization setting a reduction target of 40% by 2025. However, achieving this target faces challenges due to varying stages of nutrition

policy implementation and health system development across countries (Mengesha et al, 2021). It is projected that by 2025, stunting reduction may only reach 26%, necessitating comprehensive approaches that integrate nutrition-specific and nutrition-sensitive interventions.

Stunting has significant implications, including reduced productivity, cognitive impairment, poor educational performance, and increased morbidity and mortality rates among affected children (Tumilowicz 2018). Diagnostic criteria consider children with length-for-age or height-for-age Z-scores below negative two standard deviations (-2 SD) from the reference population median as stunted or chronically malnourished.

As part of its strategy to address stunting and micronutrient deficiencies, the World Food Programme (WFP) supports private producers in developing and marketing enriched nutritional foods meeting international standards (WFP 2018). These efforts include providing technical and financial assistance to producers and connecting them with smallholder farmers, resulting in products such as Tomvita, Maisoya, GrowNuts, and Koko plus, targeting pregnant and nursing mothers and children as complementary foods.

ENVAC's main objective is to prevent stunting and address micronutrient deficiencies, employing the 1,000-day framework approach, promoting healthy diets, and supporting smallholder farmers and food processors. Collaborating with the Ghana Health Service and other partners, ENVAC disseminates information on proper infant and young child feeding practices and implements behavior change communication strategies (WFP 2017).

Despite concerted efforts by various stakeholders, stunting remains a persistent challenge in Ghana. An assessment of ENVAC's influence on the dietary quality and nutritional status of women and children, particularly beneficiaries, is crucial for informing future interventions and addressing implementation barriers. This study aims to determine the association between ENVAC rations and the nutritional status of children under 24 months, providing valuable insights for stakeholders in nutrition interventions.

II. METHODS

STUDY AREA

The research was conducted in Sagnarigu Municipality, located in the Northern Region of Ghana. With a population of 341,711 according to the 2021 census. The municipality shares boundaries with Tamale Metropolis, Savelugu Nanton Municipal, Tolon, and Kumbungu Districts. It is subdivided into six sub-municipals to enhance healthcare services delivery, including Taha, Kamina, Choggu, Sagnarigu, Malshegu, and Garizegu. Sagnarigu Municipality hosts forty-two health facilities, both private and public, catering to the healthcare needs of its residents (GSS 2021).

STUDY DESIGN

An analytical cross-sectional study design was employed to investigate the research questions.

STUDY POPULATION

The study focused on women with children under 24 months of age, comprising both beneficiaries and non-beneficiaries of the programme. Inclusion criteria encompassed infants and children under 24 months in good health, while exclusion criteria involved severely malnourished children and those with serious medical conditions. Additionally, beneficiaries enrolled in the programme for less than six months were excluded due to insufficient exposure to project benefits.

SAMPLING TECHNIQUE

A multi-stage sampling technique was utilized. Three sub-municipals were randomly selected, followed by the random selection of four health facilities implementing the project. Sample sizes for each facility were determined based on average monthly attendance. Participants were then selected through simple random sampling from those attending health facilities during the study period.

DATA COLLECTION

Data were collected from August 2020 to September 2020 by the researcher and six trained research assistants. Information was gathered through checklist and questionnaire administration, 24-hour dietary recall, and anthropometric measurements. Standardized questionnaires were adapted from the Enhanced Nutrition and Value Chains (ENVAC) project Mobile Data Collection Application (MDCA) software. Anthropometric measurements were taken using WHO Anthro software version 2.0.4 and Statistical Package for Social Sciences (SPSS) version 25.

MEASUREMENTS OF STUDY VARIABLES

Variables were measured based on their level of measurement, ranging from categorical to ratio. Anthropometry, dietary diversity, and morbidity of participating children were assessed through questionnaires and measurements. Quantities of rations received and utilization at the household level were evaluated using checklists and questionnaires.

DATA ANALYSIS

Data were processed and analyzed using WHO Anthro software version 2.0.4 and SPSS version 25. Statistical tests including chi-square test, student's t-test, and logistical regression analysis were employed to assess differences between study groups and associations between nutrition interventions and stunting. Descriptive statistics such as frequencies, percentages, means, and medians were used to analyze demographic and socioeconomic data of

caregivers/parents. Results were presented in frequency distribution tables and charts.

The study conducted in Sagnarigu Municipality employed a rigorous analytical cross-sectional design to investigate the association between nutrition interventions and stunting among children under 24 months. Utilizing a multi-stage sampling technique and standardized data collection tools, the research provided valuable insights into the nutritional status and dietary diversity of beneficiaries and non-beneficiaries, contributing to evidence-based decision-making for future interventions.

III. RESULTS

A. NUTRITIONAL STATUS AND THE INFANT AND YOUNG CHILD FEEDING (IYCF) PRACTICES

The nutritional status and dietary practices of children are presented below in Table 4. 2. The negative z-scores for the entire study population indicate that the children in the study sample are less well-nourished relative to the WHO standard population. The prevalence of chronic, acute and underweight was 9.0 %, 8.6 % and 10.2 % respectively.

Among the 256 children who were aged 6-23 months, the mean dietary diversity score (DDS) was 3.69 ± 1.71 with 40.6 % of the children meeting the minimum dietary diversity score of five or more food groups (≥ 5 food groups). The proportion of children who met the acceptable diet was 28.1 % Most (98.6 %) of the mothers were still breastfeeding.

B. DIETARY DIVERSITY AND FREQUENCY OF CONSUMING SPECIFIC FOODS AMONG BENEFICIARY AND NON-BENEFICIARY MOTHERS AND CHILDREN

Individual dietary diversity score gives a reflection of the intake of nutrient adequacy by the individual, and was therefore utilised as a measure of the quality diet consumed. Table 4.3 shows the results of frequency of consuming selected food groups in the past 24 hours prior to the study. The beneficiary children consumed much more grains, roots, and tubers, as well as meat and other fruits and vegetables compared to the non-beneficiary children. However, the frequency of consuming nutrient dense foods such as dairy products, eggs, legumes & nuts, milk, and fruits and vegetables was not different between the beneficiaries and non-beneficiaries. There was no significant difference in the mothers' dietary diversity in this study. Whereas 253 % of beneficiary women met the new minimum dietary diversity score for women (MDD-W), 21.7 % did so among the non-beneficiary women.

C. COMPARISON OF CHILD GROWTH AND THE INFANT AND YOUNG CHILD FEEDING (IYCF) INDICATORS ACCORDING TO STUDY GROUPS

This study compared the prevalence of stunting between beneficiaries and non-beneficiaries' children. The results show that the intervention significantly associated with increased

mean LAZ but not WLZ) and WAZ. However, no significant difference was observed in terms of WLZ and WAZ. Similar child feeding practices were recorded in both study groups.

D. PREDICTORS OF LENGTH-FOR-AGE Z-SCORE (LAZ): MULTIVARIABLE REGRESSION ANALYSIS

Non-beneficiary children had a mean LAZ of 0.152, which was lower than their counterparts who received the food rations ($p = 0.001$) after controlling for potential confounding factors.

When the beta coefficients (β) were taken into account, children aged 12-24 months had a mean LAZ of -0.228 standard units, which was significantly lower than children aged less than 6 months [$\beta = [-0.228$ (95 percent CI: - 0.48 to - 0.21)]. A unit increase in maternal height led to increased LAZ of 0.138 standard units = [$\beta = 0.228$ (95% CI: 0.009, 0.04)]. In comparison, children who were born to mothers with at least Senior High School education had a mean LAZ that was significantly higher by 0.093 standard units ($\beta = 0.093$, $p = 0.048$) than children whose mothers had no formal education. When comparing children born to women who aged at least 35 years old to that of children born to women under 25 years old, children born to women who aged 35 years old and above had a higher mean LAZ of 0.100 standard units ($\beta = 0.100$, $p = 0.032$). The set of variables accounted for 8.6 % of the variance in mean LAZ (Adjusted R Square = 0.086).

E. TYPES AND QUANTITIES OF RATION BENEFICIARIES RECEIVE AND, UTILIZATION OF THE RATIONS AT THE HOUSEHOLD LEVEL

Redemption of rations was analysed using descriptive statistics, and 2.3% of the respondents (lactating mothers with children less than six months) did not receive the rations, while 64.7% received the rations. TomVita or Maisoya, vegetable oil, and the iodized salt were not applicable for 33% of the respondents. For the redemption of GrowNuts or Kokoplus, 22 participants, representing 10% of the beneficiaries did not receive the rations but 23.5% respondents receive the rations. However, GrowNuts or Kokoplus was not applicable to 66.5% of the respondents, representing 147 participants.

In terms of person or persons who consume the GrowNuts, the results indicate that 57.1% of the index children less than 23 months, representing 40 respondents, did not share the rations with others. On the contrary, the results revealed that 30% of the respondents shared the rations with their siblings who are older than 23 months, and 12.9% shared their rations with older siblings and adults as well.

For person or persons who consume the TomVita/Maisoya, the results depict that 20.1% of the index women (pregnant/lactating women) did not share their rations with others but consume it alone. However, 37.6% and 42.3% of the respondents shared the rations with their children and the entire household respectively.

IV. DISCUSSION

The study assessed stunting prevalence among beneficiary and non-beneficiary children under the stunting prevention programme, and also dietary diversity of mothers and their children, as well as morbidity of children and where treatment was sought. Assessment of the types and quantities of rations beneficiaries receive monthly, and utilization of the rations at the household level was also done.

In comparison to the non-beneficiary group, the findings revealed that children in the beneficiary group were well-nourished according to WHO standards. However, there was no difference between the two study groups in terms of dietary diversity and morbidity.

The study also found out that there was some sort of non-adherence to the project recommendations as to what quantity of rations a beneficiary should consume within a period of one month. Sharing of the rations with other members in the households was revealed in the study.

A. COMPARISON OF STUNTING PREVALENCE BETWEEN BENEFICIARY AND NON-BENEFICIARY CHILDREN UNDER 24 MONTHS

The prevalence of stunting differed significantly between beneficiary and non-beneficiary children, showing a statistically significant difference in length-for-age Z-score (LAZ) and a positive association with the intervention, whereas weight-for-height Z-score (WHZ) and weight-for-age Z-score (WAZ) did not exhibit significant differences. Beneficiary children had a higher mean LAZ compared to non-beneficiaries ($p = 0.001$), consistent with studies such as (Adu-Afarwuah, Lartey et al. 2016), (Das and Prinzo 2018), and (Dewey 2016), which found that small-quantity, lipid-based nutrient supplements (SQ-LNSs) during pregnancy, lactation, and infancy improve linear growth. Specialized nutritious foods fortified with micronutrients like iodine, amino acids, zinc, and iron, particularly zinc, promote linear growth (Millward 2020). The LAZ increase among beneficiaries may be attributed to these foods' consumption, as nutrients like iodine, amino acids, and zinc activate growth-plate endochondral ossification, enhancing linear growth (Millward 2020). However, some beneficiaries with $LAZ < -2$ could be due to non-adherence to intervention protocols, including ration sharing. Malabsorption and nutrient deficiencies, such as vitamin C's role in iron absorption, may limit supplement effectiveness. Despite multiple micronutrient-fortified food supplements' positive impact on weight and height, iron may not significantly increase children's weight and height (Perumal, Bassani et al. 2018). Micronutrients in the supplements primarily promote linear growth rather than weight gain, potentially explaining the lack of significant differences in weight-for-length Z-score (WLZ) and WAZ between intervention and non-intervention groups (Millward 2020).

B. NUTRITIONAL STATUS AND THE INFANT AND YOUNG CHILD FEEDING (IYCF) PRACTICES

The study sample revealed a prevalence of negative z-scores among respondents, indicating undernourishment relative to the WHO standard population, aligning with (Perumal, Bassani et al. 2018), who associate stunting with height-for-age below minus two standard deviations from the WHO Child Growth Standards. Moreover, breastfeeding prevalence showed no significant difference between intervention and control groups ($p = 0.4$), consistent with (Rusmil, Prahastuti et al. 2019), suggesting breastfeeding exclusivity doesn't affect stunting prevalence. However, only 40.6% of children aged 6-24 months achieved minimum dietary diversity (MDD) of ≥ 5 food groups, and 28.1% met the minimum acceptable diet (MAD), reflecting feeding practice challenges, echoing (Saaka, Larbi et al. 2016), highlighting regional disparities in Northern Ghana's complementary feeding practices. Despite improved minimum meal frequency (MMF), stunting prevalence may stem from inadequate child feeding practices, similar to (Wemakor and Iddrisu 2018), who found no association between MMF, MDD, and MAD with stunting, calling for further research on stunting causes despite enhanced MMF, MDD, and MAD in other studies. Notably, meeting MMF and MDD is crucial, as they reflect a child's energy requirements and indicate food supplementation frequency, presenting essential proxy indicators for micronutrient sufficiency and reducing morbidity and mortality risks. Encouragingly, minimum meal frequency prevalence in this study contrasts with (Wagris, Seid et al. 2019), who reported low MMF practice prevalence in Ethiopia.

In this study, 4.5% of the children from the intervention group were stunted. Though this could be attributed to other factors, it is clear in the study that there was non-adherence to the project protocols with regards to the rations consumption. This adds up to the position of Tumilowicz et al., (2018) that non-adherence to intervention protocols of SQ-LNS supplementation, together with other factors contribute to lack of improvement in linear growth in some children populations. Despite the fact that stunting is a global public health concern, some people still do not perceive it to be a problem and that is why the target group of some nutrition interventions sometimes get sub-optimal consumption of the rations in foods supplementation (Zaidi et al., 2019).

In order to estimate the magnitude of the rations sharing, the study further found out that only 18.8% of the index women consume the rations according to the project protocols, whereas majority of the index mothers consumed the rations with their children and the entire household ranging from one person to four or more persons in a household.

In conclusion, the results show that the intervention was positively associated with increased mean LAZ but not WHZ and WAZ. Stunting prevalence was high among children who are twelve months and older, compared to children who are less than six months. Furthermore, there was a statistically significant difference in the prevalence of stunting between the beneficiary and the non-beneficiary groups, especially children who consume GrowNuts versus children who did not consume the GrowNuts.

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