A Comparative Study on the Effectiveness of Nutrition Education among Caregivers on Dietary Diversification on Children in Urban vs. Rural Central Kajiado, Kenya

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ABSTRACT

Dietary diversification is essential for optimal child nutrition, particularly in regions facing food insecurity like Kajiado County, Kenya. This study examined the demographic and socio-economic characteristics of mothers and evaluated the effectiveness of a nutrition education intervention on dietary diversity among caregivers of children aged 6–59 months in both rural and urban areas of Kajiado Central. The intervention was guided by Social Cognitive Theory, targeting children's skills and confidence to eat healthy foods. A mixed-methods approach was employed, involving 294 participants equally drawn from rural and urban settings. Caregivers received structured nutrition education, and changes in their nutrition knowledge and children's dietary diversity scores (DDS) were measured pre- and post-intervention. Quantitative data were analyzed using SPSS Version 26, while qualitative insights from focus group discussions were thematically analyzed. The majority of caregivers were female (98.6%), with notable differences in age, marital status, household size, and income between rural and urban areas. While both groups demonstrated high levels of education and nutrition knowledge, dietary diversity remained low, particularly in rural areas. Post-intervention, urban caregivers showed a statistically significant improvement in dietary diversity (mean DDS increase from 5.15 to 6.35, p = 0.002), while rural improvements were marginal and not statistically significant (mean DDS increase from 3.15 to 3.45, p = 0.074). Qualitative findings revealed cultural beliefs, limited market access, and male-dominated decision-making as key barriers in rural settings, whereas urban caregivers cited financial constraints and time limitations. The study concludes that while nutrition education improves knowledge, its effectiveness on behavior change is contingent on addressing structural, economic, and cultural barriers. A multifaceted, context-specific approach is recommended to sustainably enhance dietary practices.

Keywords: Nutrition Education, Dietary Diversity, Rural-Urban Differences, Cultural Barriers

INTRODUCTION

Dietary diversification is a crucial component of achieving optimal nutrition and health, especially among children. It involves consuming a wide variety of foods that supply essential nutrients for physical growth, cognitive development, and immune system strength. Limited dietary diversity has been linked to micronutrient deficiencies and malnutrition, which remain persistent challenges in many developing regions, including Kenya. Children are particularly vulnerable to the adverse effects of poor nutrition, which can result in stunted growth, weakened immunity, and impaired cognitive abilities. Therefore, addressing dietary diversification in children is of paramount importance to enhance their overall nutritional status and health outcomes.

Dietary diversification is influenced by various factors, such as socio-economic conditions, cultural practices, food availability, and caregiver awareness. Among these, nutrition education stands out as a critical intervention that empowers caregivers with the knowledge and skills to incorporate diverse foods into children's diets. By improving caregivers' understanding of nutrition, dietary habits at the household level can be positively influenced, ultimately enhancing children's health and reducing malnutrition rates (Black et al., 2017).

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Kajiado County, located in the arid and semi-arid lands (ASALs) of Kenya, presents a unique case for studying dietary diversification due to its documented food insecurity. ASAL regions are often characterized by unpredictable rainfall, limited agricultural productivity, and high poverty levels, leading to food shortages and poor dietary diversity (GoK, 2018). In such regions, food insecurity directly correlates with malnutrition, as limited food access restricts dietary diversity, affecting children's growth and health outcomes (WFP, 2019). Rural Kajiado is predominantly inhabited by the Maasai community, who are traditionally pastoralists.

Their diet is mainly composed of animal products such as milk, meat, and blood, with minimal consumption of plant-based foods due to cultural practices and limited agricultural activities (Njarui et al., 2016). Their socio-economic structure revolves around livestock rearing, with most households relying on cattle for sustenance and income generation. Their land, being less arable, is primarily used for grazing, and farming is not widely practiced. Consequently, their dietary diversity is often low, increasing their vulnerability to malnutrition (Kimani-Murage et al., 2015).

The Maasai community's cultural norms and economic reliance on pastoralism present unique challenges to improving dietary diversity. At the same time, urban areas within Kajiado showcase a contrasting dynamic. Urban Kajiado is home to a diverse population, including individuals from various ethnic groups such as Kikuyu, Kamba, and Somali, alongside the Maasai. Many urban residents engage in formal employment or business activities, resulting in a less dominant influence of Maasai cultural practices on dietary habits. Unlike the rural areas, urban Kajiado is less influenced by traditional Maasai dietary patterns, as residents have access to markets offering a variety of food items. However, urban residents may face other challenges related to food diversity, such as economic constraints or access to affordable nutritious foods (KNBS, 2022).

Previous studies have largely focused on rural Kajiado, often overlooking urban areas, thereby providing an incomplete representation of dietary practices in the county. Given the disparities in cultural influence, socio-economic activities, and food access, it is crucial to examine whether nutrition education has a different effect on dietary diversification among caregivers in rural versus urban Kajiado. Understanding these differences will help in designing targeted nutrition education programs that effectively address dietary challenges in both settings.

This study, therefore, seeks to compare the effectiveness of nutrition education among caregivers on dietary diversification in urban and rural Kajiado. By examining the influence of nutrition education across these distinct settings, the study aims to generate evidence-based insights that can inform targeted interventions to improve dietary diversity and nutritional outcomes in children.

MATERIALS AND METHODS

Theoretical Model

This intervention was explicitly theory-driven. Social Cognitive Theory (SCT) was adopted as the guiding framework. The theory emphasizes self-efficacy, outcome expectations, observational learning, and goal-setting. The following table describes the role of each construct used in the intervention. Grounding the intervention in the theoretical framework strengthened the rationale for linking our educational activities to behavior change.

Table 1: Mapping of Social Cognitive Theory constructs to intervention components.

SCT Construct	Intervention Activity	Theoretical Target
Self-efficacy	Hands-on cooking and meal preparation exercises	Enhances participants' self-confidence in their ability to select and prepare healthy foods
Outcome expectations	Discussions/visuals about food benefits	Improves the belief that healthy behaviors result in good health
Observational learning	Role-playing, teacher modeling	Learns through observation of others eating healthy foods
Goal-setting	Setting personal diet goals	Promotes planning and commitment to healthy eating

(Bandura, 2012.)

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Study Design

This study employed both qualitative and quantitative research methods to examine the effects of nutrition education on dietary diversification among children aged 6–59 months in rural and urban Kajiado Central. A comparative approach was used to assess the effectiveness of nutrition education in these two settings.

Study Area

The study was conducted in Kajiado County, specifically in Kajiado South District, Central Division. This region was purposively selected due to its classification as an arid and semi-arid land (ASAL) where food security is a significant concern.

The region's harsh climatic conditions contribute to food insecurity, limiting access to diverse and nutrient-rich diets (Kemboi et al., 2021). Additionally, the pastoral lifestyle of the Maasai community in rural areas often leads to poor dietary diversity (Chege et al., 2015). Four locations; Sajiloni, Kiloriti, Nalepo and Majengo were randomly selected for the study. Three of these locations (Sajiloni, Kiloriti, and Nalepo) represented rural areas, while Majengo was selected to represent the urban setup.

Sample Size and Sampling Procedure

Sampling was conducted using stratified sampling based on households. The research area was stratified into rural and urban areas. Four sampling sites were selected from the stratified groups; three rural areas of Sajiloni, Kiloriti and Nalepo and one urban area; Majengo. From each of the selected sites, households with children aged between 6 and 59 months were randomly selected to ensure representativeness. Caregivers of the selected children (mothers) were recruited in the study A total sample size of 294 participants was computed. The sample was divided equally into two groups: 147 participants from rural areas and 147 from the urban area. The three rural locations were proportionally allocated the 147 participants. For households with more than one eligible child, one child was randomly chosen to avoid clustering effects at the child level. Purposive sampling was employed to select a homogenous group of mothers for focus group discussions (FGDs). Four FGDs were conducted; two in the rural areas and two in the urban area, with each group consisting of 10 mothers. The sample size was determined to allow comparison between rural and urban groups with adequate statistical power of 80% at a 5% significance level ($\alpha = 0.05$), accounting for equal group allocation. With a value of ICC ρ=0.02, while considering a drop-out rate of 10%, the sample size was calculated to compensate for statistical power as well potential participant loss during the research process. This approach minimized selection bias and ensured representation of both settings.

Data Collection Methods

Data was collected using a pre-tested semi-structured questionnaire which was divided into 2 sections. Section A, focused on the social-demographic and socio-economic characteristics of the caregiver while section B collected data on the caregiver's nutrition knowledge. The questionnaire was validated by using a panel of research nutrition professionals along with a field test.

The nutritional knowledge of caregivers was determined through a nutrition test with a set of 20 questions given to the caregivers. The questions focused on breastfeeding, complementary feeding, frequency of feeding, dietary diversity, food groups, food balance and responsive feeding. The scores were rated as a percentage; 0 - 20 (very low), 21 - 40 (low), 41 - 60 (moderate), 61 - 80 (high), and > 81 (very high).

Dietary diversity was assessed using a 24-hour recall. In addition to the 24-hour recall, food diversity score was conducted by analysing the number of food groups consumed by the child from a set of 12 food groups. A dietary diversity score cut-off-point of 6 food groups was used as per the WHO guidelines. FGDs were used to explore the perceptions of mothers regarding factors influencing dietary diversification among their children. Each FGD session lasted approximately 60 minutes and was conducted in Kiswahili and Kimaasai.

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The discussions were audio-recorded, and field notes were taken. The interviewers transcribed the recordings, ensuring that handwritten notes were used to fill any gaps. The transcripts, originally in Kiswahili, were translated into English for analysis.

Nutrition education program was delivered to caregivers of children aged 6–59 months over a period of 6 months, comprising 12 weekly sessions of approximately 1 hour each. The intervention targeted caregivers only, with the objective of improving dietary diversity of their children. Sessions were conducted by trained nutrition educators using a standardized curriculum to ensure consistency across rural and urban settings. Teaching methods included interactive discussions, demonstrations, visual aids, and participatory learning activities tailored to caregivers' literacy levels.

Nutrition knowledge was assessed before and after the intervention, and changes in dietary diversification were recorded. Dietary outcomes (dietary diversity scores) were assessed and analyzed for children using caregiver-reported 24-hour dietary recalls. This was done pre- and post-intervention to evaluate nutrition education effectiveness in both rural and urban settings. The impact of nutrition education was compared between the two groups to determine any significant differences. Three 24-hour recalls per child aided by food models to estimate portion sizes was conducted. Recalls were collected in random order across seasons to capture variability.

Table 2 summarizes the weekly session topics and learning activities. Intervention fidelity was monitored using structured checklists, and approximately 20% of sessions were observed or recorded for quality assurance. Any deviations in the planned curriculum, such as public holidays or missed sessions, were documented and mean adherence to content was recorded.

Table 2: Curriculum Topics and Activities for Weekly Nutrition Education Sessions

Session	**Topic**	**Activities**
1	Food Groups	Sorting game using food models/pictures
2	Healthy Snacks	Demonstration: preparing fruit-based snacks
3	Portion Sizes	Measuring cups and household utensils demonstration
4	Balanced Diet	Plate model illustration and discussion
5	Infant & Young Child Feeding	Responsive feeding role-play
6	Meal Planning	Weekly meal planning exercise
7	Locally Available Foods	Identification of affordable local food options
8	Food Hygiene	Handwashing and safe food handling demonstration
9	Dietary Diversity	Group discussion using 12 food groups
10	Nutrition Myths	Correcting cultural misconceptions
11	Budget-Friendly Meals	Low-cost meal preparation demonstration
12	Review & Reinforcement	Summary games and recap discussion

Ethical Considerations

Ethical clearance for the study was obtained from the Kabarak University Ethics Review Committee (KUSERC) (Ref: Kabu 01/KUREC/001/14/10/23) and the National Commission for Science, Technology, and Innovation (NACOSTI) (Ref No: 801277). Approval was also sought from the Kajiado County Health Director. Informed consent was obtained from all participants before the study commenced. The study objectives and protocols were explained to the local administration, community leaders, and respondents.

Data Analysis

Quantitative data was entered into SPSS Version 26 for statistical analysis. Nutrition knowledge was assessed before and after the intervention to determine changes in awareness. Similarly, dietary diversity scores (DDS) were measured pre- and post-intervention to assess differences in dietary diversification. The analysis focused on identifying changes in DDS and comparing these changes between rural and urban participants.

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To compare dietary diversity scores before and after the intervention, paired t-tests were conducted for within-group analysis to determine if there was a significant change in DDS over time. Covariates were child age, gender, and family socio-economic status, while seasonality and food security were predefined as potential confounders. To determine whether the difference in the mean changes between the two groups was statistically significant, an independent sample *t*-test was performed comparing the mean change in DDS. Statistical significance was set at $p<0.05$.

For qualitative data, thematic analysis was performed. The transcripts from FGDs were analyzed to identify emerging themes related to caregivers' perceptions of dietary diversity. A verbatim transcript of each discussion was generated and compared with handwritten notes to ensure completeness. The data were then coded and categorized into themes for interpretation.

By triangulating qualitative and quantitative methodologies, this study provided a comprehensive understanding of how nutrition education influences dietary diversification in different socio-economic and cultural contexts within Kajiado County.

RESULTS

Demographic and Socio-Economic Characteristics of the Mothers

The majority (98.6%) of the caregivers were female. The ages of the caregivers ranged from 18 to 51 years. In rural areas, over 81% of the mothers were below 29 years. Conversely, in urban areas, most mothers (76%) were between 24 and 34 years. In the rural setting, most caregivers (93.1%) were married, with fewer than 7% being single, separated, divorced, or widowed. Similarly, in urban areas, the majority (80%) were married, though the proportion of single, widowed, divorced, or separated mothers was slightly higher 19.9% as compared to the rural.

Educational attainment was relatively high in both settings, with 50% of respondents having completed secondary education. Household sizes differed significantly between rural and urban areas. In rural households, the most common size was five members (43.3%), with a mean household size of 5.2 ± 1.54 SD. In urban areas, household sizes ranged from 1 to 5 members, with a mean of 2.2 ± 1.54 SD.

Income levels also varied markedly. In rural areas, most households (58.3%) earned between 4,001–6,000 KES per month, with an average income of 5,391.3 ± 1,520 SD. In urban areas, most households (59.7%) earned between 15,000–30,000 KES.

Nutrition Knowledge and Dietary Diversity Score

At baseline, nutrition knowledge levels were relatively high in both settings, with 60.9% (rural) and 71% (urban) caregivers scoring in the high category. Post-intervention, knowledge levels improved significantly, with a mean score increase from 61.0 ± 1.2 SD to 75.0 ± 1.2 SD in rural areas and from 71.0 ± 1.2 SD to 88.0 ± 1.2 SD in urban areas. Dietary diversity remained low in rural areas despite the intervention. At baseline, 83% of rural children consumed three meals per day, with an average DDS of 3.15 ± 1.2. Post-intervention, the DDS increased marginally to 3.45 ± 1.2. In contrast, urban children showed a significant improvement, with their DDS increasing from 5.15 ± 1.2 to 6.35 ± 1.2 post-intervention.

To assess the effectiveness of the nutrition education intervention, a paired *t*-test was conducted within each group to compare dietary diversity scores (DDS) at baseline and post-intervention. In the rural group, the mean DDS increased marginally from 3.15 ± 1.2 to 3.45 ± 1.2, resulting in a mean change of 0.3. The paired *t*-test indicated that this change was not statistically significant ($p = 0.074$, $p > 0.05$). Conversely, in the urban group, the mean DDS increased from 5.15 ± 1.2 to 6.35 ± 1.2, with a mean change of 1.2. The paired *t*-test showed that this increase was statistically significant ($p = 0.002$, $p < 0.05$), suggesting a notable improvement in dietary diversity post-intervention. To determine whether the difference in the mean changes between the two groups was statistically significant, an independent sample *t*-test was performed comparing the mean change in DDS (0.3 in rural vs. 1.2 in urban). The results revealed a statistically significant difference ($p = 0.013$, $p < 0.05$),

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indicating that the intervention had a significantly greater impact on dietary diversity in urban areas compared to rural areas.

Qualitative Findings on Dietary Diversity and Barriers to Dietary Diversification

Rural Setting

Mothers from the rural areas reported that children were primarily fed on thin porridge made from maize flour, ugali (a mixture of maize flour and boiled water), rice, beans, and milk. These foods largely revolved around three main food groups: cereals, milk, and fat.

The intake of fruits and vegetables was notably low, which was attributed to cultural beliefs among the Maasai community. Green vegetables were perceived as livestock feed and were rarely consumed. Additionally, the Maasai culture discourages frequent slaughter of animals, as livestock is regarded as a symbol of wealth and is only slaughtered on special occasions. The cultural norms also prohibit the consumption of fish and poultry, further limiting dietary diversity.

Another key cultural aspect affecting food diversity was the restriction on selling livestock, which contributed to low household income. Despite these limitations, respondents clarified that their restricted dietary diversity was not due to a lack of nutritional knowledge. Many participants expressed awareness of the importance of a diverse diet, including fruits and vegetables, for optimal child nutrition. However, they highlighted significant barriers to food availability, including the absence of nearby markets, poor road infrastructure, and the impracticality of storing perishable items due to the risk of spoilage.

Mothers also pointed out that men, as household decision-makers, needed to be educated on nutrition. They explained how conducting kitchen gardening, poultry farming, and slaughter of small animals would cause domestic problems since these activities were not prevalent in their culture. As a result, even though women recognized the benefits of these practices, they hesitated to adopt them. The respondents strongly recommended that, in addition to training women, men should also receive nutrition education to foster household-wide support for dietary improvements.

Urban Setting

Findings from focus group discussions (FGDs) in the urban setting differed significantly from those in the rural areas. Unlike the rural group, the urban participants represented a mix of ethnic backgrounds, including Kikuyu, Kamba, Taita, Maasai, Somali, and Luhya.

A major theme that emerged was the broad nature of previous nutrition education programs, which made it difficult for mothers to recall and apply what they had learned. However, the recent nutrition training focused specifically on dietary diversification, different food groups, meal planning and the importance of a diverse diet, which made it easier for them to implement the knowledge gained.

Despite having better access to food variety, urban mothers pointed out financial constraints as a limiting factor. Some participants mentioned that their purchasing power was low, making it difficult to provide different food groups daily. Additionally, time constraints due to work commitments influenced meal choices. Many mothers reported relying on quick and readily available foods such as chips, smokies, samosas, chapatis, and mandazi (street foods) due to the limited time available for meal preparation. The urban mothers emphasized that regular nutrition training with a focus on specific topics, given adequate time for discussion and application, would be more beneficial in promoting dietary diversification.

DISCUSSION

The findings indicate that the curriculum based on Social Cognitive Theory (SCT) was linked to better food variety and caregiver feeding behavior practices as well as greater nutrition knowledge for caregivers of 6-59-month-old children. This study indicates that the majority of caregivers were female (98.6%), with significant age differences between rural and urban areas. In rural settings, over 81% of the mothers were below 29 years,

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while in urban areas, most (76%) were between 24 and 34 years. This trend aligns with existing literature indicating that early marriage is more prevalent in rural areas due to cultural traditions (Mberu & Ezeh, 2017). Early marriage in rural areas limits women's opportunities for higher education and employment, contributing to economic dependency and lower household incomes. Therefore, policies promoting delayed marriage and educational empowerment programs targeting rural women are recommended to enhance their socio-economic status.

Marital status patterns also differed, with a higher percentage of single, widowed, or separated mothers in urban areas (19.9%) compared to rural areas (6.9%). This finding is consistent with studies showing that urbanization often leads to increased single parenthood due to higher separation and divorce rates, as well as shifting family structures (Ezeh et al., 2019).

The implications of this finding highlight the need for targeted support programs, such as financial aid and childcare assistance, to help single mothers manage household food security and child nutrition effectively.

Education levels were relatively high in both settings, with 50% of respondents having completed secondary education. This is in line with findings from Kenya's national education data, which attribute improved secondary school completion rates to the government's free education policy (World Bank, 2020). Education plays a crucial role in dietary knowledge and child nutrition; thus, further efforts should be made to integrate nutrition education into school curriculums to reinforce dietary diversification at the household level.

Household sizes varied significantly, with rural households having a mean size of 5.2 ± 1.54 SD compared to 2.2 ± 1.54 SD in urban areas. Larger household sizes in rural areas have been linked to traditional values that encourage large families for social and economic security (Mutisya et al., 2018). However, large households often struggle with food security due to resource constraints. Family planning programs and economic empowerment initiatives targeting rural families could help balance household sizes and food accessibility.

Income disparities between rural and urban households were evident, with rural households earning an average of 5,391.3 ± 1,520 KES per month, whereas urban households earned between 15,000–30,000 KES. These findings corroborate previous research suggesting that rural areas experience higher poverty rates and economic marginalization (Kimani-Murage et al., 2015). Income directly influences food accessibility and dietary practices; therefore, income-generating programs, improved market access, and infrastructural development in rural areas are necessary to enhance food security.

Nutrition knowledge levels were relatively high in both settings, with improvements post-intervention. In rural areas, knowledge scores increased from 61.0 ± 1.2 SD to 75.0 ± 1.2 SD, while in urban areas, they increased from 71.0 ± 1.2 SD to 88.0 ± 1.2 SD. This supports findings by FAO (2019), which indicate that targeted nutrition education interventions effectively enhance knowledge. However, despite increased knowledge, dietary diversity remained low in rural areas, indicating that knowledge alone is insufficient to drive behavioral change. Structural interventions, including improving food access and affordability, are essential to complement educational efforts.

Dietary diversity remained a key challenge, particularly in rural areas. At baseline, the mean DDS was 3.15 ± 1.2, increasing marginally to 3.45 ± 1.2 post-intervention. In contrast, urban children showed a more substantial increase from 5.15 ± 1.2 to 6.35 ± 1.2. These results are similar to previous studies indicating that urban populations have greater access to diverse foods due to better market infrastructure and higher purchasing power (Ngugi et al., 2021). The statistically significant improvement in urban dietary diversity ($p = 0.002$) suggests that nutrition education had a more pronounced effect where food accessibility was not a major constraint. To enhance dietary diversity in rural areas, interventions should focus on agricultural diversification, market access, and community-based nutrition programs.

Qualitative findings further highlighted cultural barriers to dietary diversity in rural areas. Many caregivers reported that food choices were heavily influenced by Maasai cultural norms, which discouraged the consumption of vegetables, poultry, and fish. Similar findings have been documented in other studies on indigenous communities, where cultural perceptions dictate dietary habits (Oiye et al., 2020). Addressing these

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barriers requires culturally sensitive nutrition education that engages community leaders and integrates locally acceptable dietary modifications.

Additionally, rural mothers emphasized that men, as household decision-makers, need to be educated on nutrition to facilitate better dietary practices. This aligns with research showing that male involvement in nutrition interventions leads to improved household dietary outcomes (Mboganie et al., 2018). Therefore, future programs should incorporate male-targeted nutrition education alongside women-focused training.

Urban caregivers, on the other hand, highlighted financial constraints and time limitations as key barriers to dietary diversification. Many reported relying on fast foods due to work commitments. This is in line with findings by Kamau et al. (2022), which suggest that urbanization and employment patterns contribute to reliance on convenience foods. Practical interventions such as workplace nutrition programs, meal planning education, and promotion of healthy, quick-to-prepare meals could help urban families improve dietary diversity.

CONCLUSION

The results of this study highlight the positive impact of nutrition education on the knowledge of caregivers of children aged 6-59 months. However, the effectiveness of nutrition education in increasing dietary diversity depends on structural and cultural factors. The results reveal the importance of integrated and multi-sectoral approaches involving education and food availability, accessibility, adaptability of agriculture, and sociocultural engagement. In rural areas, the priority areas are market systems enhancement, climate-adaptive agriculture, and male engagement, whereas urban areas need affordability and accessibility of food choices. The consistency of nutrition education tools and results may be considered for application in childhood nutrition programs. Scaling such interventions will depend on sustained engagement of caregivers, health workers, and community stakeholders, supported by enabling policies and environments that reinforce behaviour change.

RECOMMENDATION

Future research should explore long-term strategies for improving food accessibility and assessing the effectiveness of integrating nutrition education into broader community development initiatives.

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Conflict of interest

The author(s) declare no conflict of interest

Data availability statement

Data supporting these findings are available within the article or upon request.

Institutional review board statement

The study was conducted in accordance with the Declaration of Helsinki and approved by Kabarak University Ethics Review Committee (KUSERC) (Ref: Kabu 01/KUREC/001/14/10/23) and the National Commission for Science, Technology, and Innovation (NACOSTI) (Ref No: 801277).

Informed consent statement

Informed consent was obtained from all participants involved in the study

Sample availability

The author(s) declare that no physical samples were used in this study.

Supplementary materials

The supplementary materials are available upon request.

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