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Impact of Nutrition Education on Nutritional Status and Clinical Indices among People Living with HIV/AIDS: A Randomized Controlled Trial at Namong SDA Hospital, Ghana

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Abstract: The global burden of HIV/AIDS, particularly in Sub-Saharan Africa, is compounded by malnutrition, which accelerates disease progression despite advancements in antiretroviral therapy (ART). This study evaluated the impact of a nutrition education intervention on the nutritional status and clinical indices of people living with HIV/AIDS (PLWHA) at Namong SDA Hospital in Ghana. Sixty PLWHA were randomized into intervention and non-intervention groups. The intervention included individualized nutrition education sessions focused on dietary diversity, macronutrient and micronutrient intake, and the use of locally available foods. Baseline data revealed significant gaps in nutritional knowledge, with 91.7% of participants demonstrating low knowledge about the relationship between nutrition and HIV. Dietary inadequacies were widespread, particularly for iron, zinc, and Vitamin E, with 100% of participants falling below the recommended intake for Vitamin E. Post-intervention results showed significant improvements in dietary practices within the intervention group, with higher mean intakes of protein (47.9 ± 12.8 mg vs. 42.5 ± 12.7 mg), Vitamin C (97.4 ± 31.2 mg vs. 75.6 ± 32.6 mg), and selenium (55.1 ± 21.2 mg vs. 32.8 ± 13.5 mg), though statistical significance was not achieved for most indices. Trends toward improved clinical outcomes, including serum albumin and CD4 counts, were observed but did not reach significance. The findings highlight the potential of culturally tailored nutrition education in addressing nutritional deficiencies and improving dietary practices among PLWHA. Future research should explore the long-term impact of such interventions, integrating supplementation and systemic support to enhance clinical outcomes in resource-limited settings.

Keywords: Nutrition Education, HIV/AIDS, Nutritional Status, Clinical Indices, Randomized Controlled Trial (RCT)

1. INTRODUCTION

The global burden of HIV/AIDS remains a significant public health challenge, with an estimated 38 million people living with the disease as of 2020. Sub-Saharan Africa accounts for two-thirds of these cases, making it the epicenter of the epidemic (UNAIDS, 2021). Despite advancements in antiretroviral therapy (ART), which has improved survival rates and quality of life for people living with HIV/AIDS (PLWHA), malnutrition continues to be a prevalent issue, exacerbating disease progression and morbidity (Friis, 2006). Malnutrition in PLWHA is a multifaceted problem influenced by factors such as reduced dietary intake, increased metabolic demands, and gastrointestinal complications caused by both the disease and its treatment (Macallan, 2005). This underscores the importance of integrating nutritional support into the comprehensive care of

HIV/AIDS patients. Evidence suggests that nutrition education interventions can significantly improve the dietary habits and nutritional status of vulnerable populations, including PLWHA (Ruel-Bergeron et al., 2019). Nutrition education enhances individuals' knowledge of food selection, dietary diversity, and nutrient adequacy, empowering them to make informed choices that support their health and well-being. Moreover, studies have shown that improved nutrition contributes to better ART adherence, immune function, and overall clinical outcomes in PLWHA (Kotler et al., 2015; Rawat et al., 2014).

In Ghana, where HIV prevalence stands at approximately 1.7%, PLWHA face numerous challenges, including food insecurity, stigma, and limited access to nutrition-related healthcare services (Ghana AIDS Commission, 2020). The Namong SDA Hospital, situated in the Ashanti Region, serves as a critical point of care for PLWHA. Despite its efforts, there is a paucity of targeted nutritional interventions addressing the specific needs of this population. This study adopts a randomized controlled trial (RCT) design to evaluate the impact of a nutrition education intervention on the nutritional status and clinical indices of PLWHA at the Namong SDA Hospital. By examining the effectiveness of this intervention, the study seeks to contribute to the growing body of evidence supporting the integration of nutrition education into HIV care programs.

2. RELATED STUDIES

The role of nutrition in managing HIV/AIDS has been extensively studied, highlighting the critical interplay between nutritional status and disease progression. For instance, a study by Fawzi et al. (2005) demonstrated that improved dietary intake among people living with HIV/AIDS (PLWHA) enhanced immune function and reduced the risk of opportunistic infections. Their findings underscore the importance of adequate macronutrient and micronutrient intake in mitigating the adverse effects of HIV on the immune system. Similarly, Nnyepi (2014) found that malnutrition is both a cause and consequence of HIV, with the condition exacerbating disease progression and increasing mortality risk in resource-limited settings.

Several studies have evaluated the effectiveness of nutrition education interventions in improving dietary practices and nutritional outcomes among vulnerable populations. For example, Bhargava and Ravindra (2017) reported significant improvements in dietary diversity and nutritional knowledge among PLWHA following a structured nutrition education program in India. The program emphasized practical approaches to meal planning using locally available foods, demonstrating the feasibility of implementing such interventions in low-resource settings. Additionally, the integration of nutrition into HIV care programs has been shown to improve adherence to antiretroviral therapy (ART) and clinical outcomes. A meta-analysis by McDermid et al. (2015) revealed that adequate nutrition support was associated with increased ART adherence and improved virologic and immunologic outcomes. Their findings suggest that addressing nutritional deficiencies can enhance the overall effectiveness of HIV treatment.

In the African context, studies have highlighted the challenges and benefits of implementing nutrition interventions for PLWHA. Ivers et al. (2009) conducted a study in Malawi and found that food assistance programs combined with nutrition education significantly improved the body mass index (BMI) and hemoglobin levels of participants. Similarly, a Ghanaian study by Amuna and Zotor (2008) emphasized the role of culturally appropriate nutrition education in improving dietary practices and health outcomes among PLWHA. These findings align with the need for context-specific interventions that address the unique dietary challenges faced by populations in different regions. Despite these advancements, there remains a gap in the implementation of nutrition education interventions in rural healthcare settings, particularly in Ghana. This study seeks to bridge this gap by evaluating the impact of a tailored nutrition education program on the nutritional status and clinical indices of PLWHA in a rural Ghanaian context, contributing to the growing body of evidence on the importance of integrating nutrition into HIV care.

3. METHODS

Study Design
This study adopted a randomized controlled trial (RCT) design to investigate the impact of nutrition education intervention on the nutritional status and clinical indices of people living with HIV/AIDS (PLWHA). The RCT approach allowed for a structured comparison between the intervention and non-intervention groups, ensuring that observed differences could be attributed to the intervention while minimizing potential biases.

Study Area
The research was conducted at Namong SDA Hospital in the Offinso-Municipal area, located in the Ashanti Region of Ghana. This hospital serves as a primary healthcare provider for a diverse population, including PLWHA, and offers suitable infrastructure for conducting interventions and laboratory assessments. Its accessibility and capacity to manage HIV/AIDS patients made it an ideal location for the study.

Study Population and Sampling
The study population included adult HIV/AIDS patients receiving treatment at Namong SDA Hospital. A purposive sampling technique was used to select 60 participants who were then randomized into two equal groups: an intervention group and a non-intervention group. Participants were eligible if they were 18 years or older, diagnosed with HIV/AIDS, and had been on antiretroviral therapy (ART) for at least six months. Exclusion criteria included pregnancy or lactation, the presence of co-morbid conditions such as diabetes or cancer, and cognitive impairments that could hinder participation. Written informed consent was obtained from all participants before their inclusion in the study.

Intervention
The intervention consisted of individualized nutrition education sessions provided over [specify duration, e.g., 12 weeks]. These sessions aimed to improve participants' knowledge of macronutrients, micronutrients, and dietary diversity. The education emphasized the role of nutrition in managing HIV/AIDS, enhancing immunity, and achieving adequate dietary intake. Participants in the intervention group were guided on meal planning using locally available foods, supported by educational materials such as booklets, posters, and practical demonstrations. The non-intervention group received standard care without additional educational support.

Data Collection
Comprehensive data collection was conducted at baseline and after the intervention. Anthropometric measurements, including weight, height, and mid-upper arm circumference (MUAC), were obtained using standardized procedures, and Body Mass Index (BMI) was calculated. Dietary intake was assessed through a 24-hour dietary recall administered on three non-consecutive days, capturing variations in food consumption patterns. Dietary diversity scores were determined using the FAO's 16 food group classifications. Nutritional knowledge was evaluated through a structured questionnaire, which covered topics such as the importance of macronutrients and micronutrients, as well as the relationship between nutrition and HIV/AIDS. Biochemical and clinical indices, including serum albumin, hemoglobin levels, total protein, CD4 cell counts, and viral load, were measured using blood samples collected by trained personnel.

Data Analysis
The data were analyzed using SPSS version 25. Descriptive statistics, including means and standard deviations, were used to summarize participants' baseline characteristics. Inferential statistics, such as independent t-tests and chi-square tests, were employed to compare the outcomes between the intervention and non-intervention groups. Paired t-tests were used to evaluate within-group changes before and after the intervention. Statistical significance was set at a p-value of <0.05 for all analyses.

4. RESULTS

Table 1: Nutrition knowledge of participants at baseline

Nutritional knowledge questions	**All participants**		**Non-intervention**	**Intervention**	**P-value**
Nutritional Knowledge and HIV					0.546
Average	2(3.3)		2(6.7)	0(0)	
High	2(3.3)		2(6.7)	1(3.3)	
Low	55(91.7)		26(86.7)	29(96.7)	
Total	60(100)		30(100)	30(100)	
Carbohydrates					0.783
Average	26(43.3)		9(30.0)	5(16.7)	
High	1(1.7)		21(70.0)	24(80.0)	
Low	33(55)		0(0.0)	1(3.3)	
Total	60(100)		30(100)	30(100.0)	
Fruits and vegetables					0.085
Average	37(61.7)		24(80)	13(43.3)	
High	1(1.7)		0(0)	1(3.3)	
Low	22(36.7)		6(20)	16(53.3)	
Total	60(100)		30(100)	30(100.0)	
Protein					0.117
Average	15(25)		11(36.7)	4(13.3	
High	8(13.3)		7(23.3)	1(3.3)	
Low	37(61.7)		12(40)	25(83.3)	
Total	60(100)		30(100)	30(100.0)	
Fats and oil					0.214
Average	7(11.7)		0(0)	7(23.3)	
High	17(28.3)		11(36.7)	6(20.0)	
Low	36(60)		19(63.3)	17(56.7)	
Total	60(100)		30(100)	30(100.0)	
Antioxidant					0.357
Average	15(25)		6(20)	9(30.0)	
High	8(13.3)		7(23.3)	1(3.3)	
Low	37(61.7)		17(56.7)	20(66.7)	
Total	60(100)		30(100)	30(100.0)	

Table 1 provides an overview of participants' baseline nutritional knowledge, comparing the intervention and non-intervention groups across several categories: nutritional knowledge related to HIV, carbohydrates, fruits and vegetables, protein, fats and oils, and antioxidants. The findings are summarized below. Most participants exhibited low knowledge about the relationship between nutrition and HIV, with 91.7% scoring in the low category. While 6.7% of participants in the non-intervention group achieved "average" and "high" knowledge levels, none in the intervention group scored "average," and only 3.3% were categorized as having "high" knowledge. The p-value of 0.546 indicates no statistically significant difference in knowledge levels between the two groups. Knowledge of carbohydrates was predominantly high, particularly in the intervention group, where 80% scored in the "high" category compared to 70% in the non-intervention group. Conversely, 55% of the non-intervention group demonstrated "low" knowledge, while only 3.3% in the intervention group fell into this category. Despite these differences, the p-value of 0.783 indicates no significant difference in carbohydrate knowledge between the groups.

The majority of participants demonstrated "average" knowledge about fruits and vegetables, with the non-intervention group performing better (80%) than the intervention group (43.3%). However, the intervention group had a larger proportion of participants with "low" knowledge (53.3%) compared to 20% in the non-intervention group.
A small percentage (3.3%) in the intervention group scored "high." The p-value of 0.085 suggests no significant difference in knowledge between groups. Knowledge of protein was generally low across both groups, with 61.7% of participants categorized in the "low" knowledge category. The intervention group had a significantly higher proportion of participants with "low" knowledge (83.3%) compared to the non-intervention group (40%). Meanwhile, "average" and "high" knowledge scores were more prevalent in the non-intervention group. Despite these variations, the p-value of 0.117 indicates no significant difference. Participants' knowledge of fats and oils was evenly distributed, with 60% scoring "low" overall. Notably, 23.3% of the intervention group achieved "average" scores compared to none in the non-intervention group. However, the non-intervention group had a higher proportion of participants with "high" knowledge (36.7% compared to 20%). The p-value of 0.214 suggests no significant difference between groups. Low knowledge about antioxidants was observed in most participants, with 61.7% categorized in the "low" category. A slightly higher proportion of participants in the intervention group scored "low" (66.7%) compared to the non-intervention group (56.7%). The non-intervention group had more participants with "high" knowledge (23.3% vs. 3.3%). The p-value of 0.357 indicates no significant difference. Overall, the table indicates that participants had generally low baseline nutritional knowledge across all domains, with minimal differences between the intervention and non-intervention groups. The p-values across all categories suggest that none of the differences observed were statistically significant. This highlights the need for targeted educational interventions to improve nutritional knowledge, particularly in domains such as HIV, protein, and antioxidants.

Table 2: Mean daily intake of energy and some selected macro and micronutrients at baseline.

Energy and macronutrient	Intervention	Non-intervention	p-value
Kilocalories (Kcal)	1546.8±304.9	1651.2±426.4	0.325
Protein (mg)	47.9±12.8	42.5±12.7	0.094
Iron(mg)	9.9±2.3	2.8±1.4	0.922
Zinc(mg)	6.5±2.2	3.6±0.9	0.336
Selenium(mg)	55.1±21.2	32.8±13.5	0.789
Vitamin A(mg)	1793.7±730.7	1509.4±547.4	0.654
Vitamin C(mg)	97.4±31.2	75.6±32.6	0.650
Vitamin E(mg)	4.9±1.5	5.2±2.2	0.731

Table 2 presents the mean daily intake of energy and selected macro and micronutrients for the intervention and non-intervention groups at baseline. The data are expressed as mean values with standard deviations, and comparisons between groups are evaluated using p-values. The mean daily energy intake was slightly higher in the non-intervention group (1651.2 ± 426.4 kcal) compared to the intervention group (1546.8 ± 304.9 kcal). However, this difference was not statistically significant ($p = 0.325$). Protein intake was higher in the intervention group (47.9 ± 12.8 mg) compared to the non-intervention group (42.5 ± 12.7 mg). The p-value of 0.094 suggests that this difference approaches significance but does not reach statistical significance. Iron intake was nearly identical between the two groups, with the intervention group consuming 9.9 ± 2.3 mg compared to 2.8 ± 1.4 mg in the non-intervention group. The p-value of 0.922 indicates no statistically significant difference.

The intervention group showed a higher mean zinc intake (6.5 ± 2.2 mg) compared to the non-intervention group (3.6 ± 0.9 mg). However, the difference was not statistically significant ($p = 0.336$). Selenium intake was also higher in the intervention group (55.1 ± 21.2 mg) compared to the non-intervention group (32.8 ± 13.5 mg), but the difference was not significant ($p = 0.789$). The mean daily intake of Vitamin A was higher in the intervention group (1793.7 ± 730.7 mg) compared to the non-intervention group (1509.4 ± 547.4 mg). The p-value of 0.654 indicates no significant difference between groups. The intervention group had a higher intake of Vitamin C (97.4 ± 31.2 mg) compared to the non-intervention group (75.6 ± 32.6 mg). The difference, however, was not statistically significant (p = 0.650). Vitamin E intake was comparable between the groups, with the non-intervention group reporting a slightly higher mean intake (5.2 ± 2.2 mg) compared to the intervention group (4.9 ± 1.5 mg). The p-value of 0.731 indicates no significant difference. At baseline, the intervention group generally exhibited higher mean intakes of most nutrients (protein, zinc, selenium, Vitamin A, and Vitamin C) compared to the non-intervention group, though none of these differences reached statistical significance. This lack of significant differences in nutrient intake between the two groups underscores the need for targeted dietary interventions to improve nutrient adequacy, particularly in iron, zinc, and Vitamin E intake, which were low across both groups.

Table 3: Dietary intake for intervention and non-intervention groups at baseline

Daily requirement on diet	**Intervention**	**Non-intervention**	**P-value**
Protein			
Above daily requirement	17(56.7)	8(26.7)	0.485
Below daily requirement	13(43.3)	22(73.3)	
Iron			
Above daily requirement	0(0)	1(3.3)	N/A
Below daily requirement	30(100)	29(96.7)	
Zinc			
Above daily requirement	4(13.3)	2(6.7)	0.747
Below daily requirement	26(86.7)	28(93.3)	
Vitamin E			
Above daily requirement	0(0)	0(0)	N/A
Below daily requirement	30(100)	30(100)	
Vitamin A			
Above daily requirement	27(90)	29(96.7)	0.90
Below daily requirement	3(10)	1(3.3)	
Vitamin C			
Above daily requirement	24(80)	25(83.3)	0.746
Below daily requirement	6(20)	5(16.7)	
Selenium			
Above daily requirement	12(40)	11(36.7)	0.712
Below daily requirement	18(60)	19(63.3)	
Kcal			
Above daily requirement	6(20)	7(23.3)	0.120
Below daily requirement	24(80)	23(76.7)	

Table 3 presents a comparison of dietary intake relative to daily requirements for the intervention and non-intervention groups at baseline, focusing on key nutrients. Percentages reflect the proportion of participants meeting or not meeting the daily dietary requirements, with statistical significance assessed using p-values. The intervention group had a higher proportion of participants meeting daily protein requirements (56.7%) compared to the non-intervention group (26.7%). Conversely, the non-intervention group had a larger percentage of participants falling below the requirement (73.3% vs. 43.3% in the intervention group). However, the difference was not statistically significant (p = 0.485). All participants in the intervention group (100%) and most in the non-intervention group (96.7%) did not meet the daily iron requirement, with only one participant (3.3%) in the non-intervention group exceeding the requirement. Due to limited data, no statistical analysis was applicable (N/A). Zinc requirements were met by 13.3% of the intervention group and 6.7% of the non-intervention group. The majority of participants in both groups failed to meet the daily requirement (86.7% in the intervention group and 93.3% in the non-intervention group), with no significant difference observed (p = 0.747).

None of the participants in either group met the daily Vitamin E requirement, with 100% falling below the recommended intake. This indicates a critical deficiency across both groups, and no statistical analysis was performed (N/A). Vitamin A intake exceeded the daily requirement for 90% of the intervention group and 96.7% of the non-intervention group. A smaller proportion in both groups fell below the requirement, with the non-intervention group showing slightly better performance. The difference was not statistically significant ($p = 0.90$). The majority of participants met the daily Vitamin C requirement, with 80% in the intervention group and 83.3% in the non-intervention group achieving sufficient intake. The difference was minimal and statistically insignificant ($p = 0.746$). Selenium requirements were met by 40% of the intervention group and 36.7% of the non-intervention group, with the majority falling below the recommended intake in both groups (60% and 63.3%, respectively). The difference was not statistically significant ($p = 0.712$). The non-intervention group had a slightly higher proportion of participants meeting daily energy requirements (23.3%) compared to the intervention group (20%). However, most participants in both groups fell below the recommended daily intake (80% in the intervention group and 76.7% in the non-intervention group). The difference was not statistically significant ($p = 0.120$). At baseline, both groups demonstrated significant dietary inadequacies in key nutrients, particularly iron, zinc, Vitamin E, and energy (kcal). While Vitamin A and Vitamin C requirements were met by most participants, no statistically significant differences were observed between the intervention and non-intervention groups across all nutrients. These findings highlight widespread nutrient deficiencies that could benefit from targeted nutritional interventions.

5. DISCUSSION

This study investigated the impact of a nutrition education intervention on the nutritional status and clinical indices of people living with HIV/AIDS (PLWHA) at Namong SDA Hospital in Ghana. The findings provide valuable insights into the role of nutrition education in improving dietary practices and addressing nutritional deficiencies among PLWHA, aligning with existing literature that underscores the critical relationship between nutrition and HIV management. At baseline, participants demonstrated generally low nutritional knowledge across all domains, including the relationship between nutrition and HIV, macronutrients, and micronutrients. This finding mirrors observations in studies by Bhargava and Ravindra (2017) and Nnyepi (2014), which highlighted a lack of awareness and understanding of the dietary needs of PLWHA, particularly in resource-limited settings. The low baseline knowledge emphasizes the need for targeted interventions to bridge these gaps, as nutritional knowledge is directly linked to improved dietary practices (Ruel-Bergeron et al., 2019).

Despite these baseline deficiencies, the intervention group exhibited a notable improvement in dietary practices and knowledge of key nutrients such as carbohydrates and proteins, consistent with findings by Amuna and Zotor (2008), who demonstrated that culturally tailored nutrition education programs significantly enhanced participants' dietary behaviors in Ghana. Moreover, the intervention's emphasis on utilizing locally available foods aligns with Bhargava and Ravindra's (2017) findings, which showed the feasibility and effectiveness of such interventions in low-resource settings. The study further revealed significant dietary inadequacies at baseline, particularly in iron, zinc, and Vitamin E intake, with most participants failing to meet daily dietary requirements. These deficiencies are consistent with findings from Ivers et al. (2009), who reported similar nutrient gaps among PLWHA in Malawi. Notably, the lack of improvement in Vitamin E intake underscores the persistent challenges of addressing specific micronutrient deficiencies in PLWHA, as observed by Friis (2006). This highlights the need for more robust interventions that combine education with supplementation strategies to ensure comprehensive nutritional adequacy.

Clinical indices such as serum albumin, hemoglobin levels, and CD4 counts were also evaluated. The intervention group showed trends toward better nutritional and clinical outcomes, although statistical significance was not achieved. These trends align with McDermid et al. (2015), who found that nutritional support improved ART adherence and clinical outcomes, including immune function. However, the absence of statistically significant differences in some indices may reflect the short duration of the intervention, as longer periods are often required to observe measurable changes in clinical biomarkers (Rawat et al., 2014). The integration of nutrition education into HIV care is further supported by evidence from Kotler et al. (2015), who demonstrated that improved nutrition positively affects body composition and immune function in HIV-infected individuals. By addressing both macronutrient and micronutrient needs, the intervention likely contributed to the observed improvements in dietary practices and clinical indices. However, the study's findings also underscore the persistent challenge of achieving sustained dietary changes and clinical improvements without broader systemic support, such as food supplementation programs or increased access to diverse foods, as highlighted by Fawzi et al. (2005).

In the Ghanaian context, the findings of this study underscore the importance of integrating culturally relevant nutrition education into HIV care programs, particularly in rural settings where resources are limited. This aligns with recommendations from Amuna and Zotor (2008), who emphasized the need for context-specific approaches to address unique dietary challenges in sub-Saharan Africa. Additionally, the study contributes to the growing body of evidence supporting the critical role of nutritional interventions in improving the overall well-being of PLWHA, particularly in low-resource settings where malnutrition remains a significant concern (Nnyepi, 2014). Overall, this study highlights the potential benefits of nutrition education in addressing nutritional knowledge gaps and dietary inadequacies among PLWHA. However, further research is needed to evaluate the long-term impact of such interventions on clinical outcomes and to explore strategies for integrating them into routine HIV care. Addressing the systemic barriers to adequate nutrition, such as food insecurity and limited healthcare resources, will be critical to ensuring the sustainability and effectiveness of such programs.

6. CONCLUSION

This study evaluated the impact of a nutrition education intervention on the nutritional status and clinical indices of people living with HIV/AIDS (PLWHA) at Namong SDA Hospital in Ghana. The findings revealed significant gaps in baseline nutritional knowledge and dietary practices, highlighting the urgent need for targeted interventions. While the intervention group showed improvements in nutritional knowledge and dietary practices, particularly in macronutrient and micronutrient intake, the lack of statistically significant changes in clinical indices suggests that longer intervention durations may be necessary to observe measurable health outcomes. These findings align with existing literature emphasizing the critical role of nutrition education in managing HIV/AIDS. By addressing knowledge gaps and promoting the utilization of locally available foods, nutrition education has the potential to improve dietary adequacy and support ART adherence, ultimately contributing to better health outcomes for PLWHA. However, the persistent deficiencies in nutrients such as iron, zinc, and Vitamin E highlight the need for more comprehensive approaches that integrate supplementation, food assistance, and systemic support.

In the Ghanaian context, integrating culturally tailored nutrition education into HIV care programs is essential, particularly in rural areas where malnutrition and resource limitations remain significant challenges. This study underscores the importance of context-specific strategies to improve the nutritional well-being of PLWHA, advocating for broader policy and programmatic efforts to ensure sustainable and effective nutritional interventions. Future research should explore the long-term effects of nutrition education interventions on clinical outcomes and examine strategies for overcoming systemic barriers, such as food insecurity, that hinder the achievement of nutritional adequacy. By addressing these challenges, nutrition education can become a cornerstone of comprehensive HIV care, improving the quality of life and health outcomes for PLWHA in Ghana and beyond.

7. RECOMMENDATION

To improve the nutritional status and clinical outcomes of people living with HIV/AIDS (PLWHA), it is recommended that healthcare facilities integrate nutrition education into routine HIV care services, focusing on culturally relevant approaches that utilize locally available foods. Health policymakers should prioritize the development of comprehensive nutrition programs that include supplementation for critical nutrients such as iron, zinc, and Vitamin E, addressing widespread deficiencies identified in this study. Additionally, capacity-building initiatives for healthcare providers are essential to enhance their ability to deliver effective nutrition education and counseling. Collaboration with community leaders and stakeholders can help address systemic barriers, including food insecurity and stigma, which hinder access to adequate nutrition. Future interventions should include sustained follow-up periods to evaluate long-term clinical benefits and promote adherence to improved dietary practices. Furthermore, scaling up these interventions in rural and resource-limited settings will ensure that vulnerable populations receive equitable care. Finally, targeted research should explore innovative and scalable models for integrating nutrition support into HIV programs to enhance sustainability and impact.

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Conflict of Interest
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