Adequacy of Nutrient Intake, Morbidity and Nutritional status of HIV and AIDS Infected Children at Pre and Post Amaranth Grain Supplementation

Abstract

Introduction: Morbidity and mortality related to human immunodeficiency virus (HIV) infection in the developing world remain unacceptably high, despite major advances in HIV therapy and increased funding internationally for care. The HIV epidemic largely overlaps with populations' already experiencing malnutrition [1]. Combating under nutrition and HIV and AIDS are two of the eight United Nations Millennium Development Goals to be achieved by 2015 [2,3]. Food and nutrition interventions are critical components of comprehensive responses to the HIV pandemic [4-6]. Provision of high quality and adequate food is a significant challenge to the caregivers due to financial constraints, inability to access adequate amounts of food and low diversibility of the diets [4]. A diverse and adequate diet is fundamental for better health for people living with HIV and AIDS [7]. Although the nutrition quality of amaranth grain in other countries has been established, amaranth grain is an underutilized crop in Kenya and yet it has the potential to broaden the food base, enhance diet diversification and reduce the levels of malnutrition among vulnerable groups such as HIV and AIDS infected children.

Objective: To determine the impact of amaranth grain supplementation on the adequacy of nutrient intake and nutrition status of HIV and AIDS infected children attending the comprehensive care clinic at Thika District Hospital, Kenya.

Methodology: The study was a longitudinal (6 months) experimental pre and post single group design, with a comprehensive sample of 52 children. The study included baseline assessment and an intervention phase. The intervention included monthly provision of adequate amaranth flour to be consumed by the children on a daily basis, nutrition education and counseling. The data collected comprised demography, dietary intake, anthropometric, morbidity, and CD4 counts.

Results: Baseline findings indicated inadequate mean intake of total kilocalories (1281.10±379.69), vitamin A (268.35±216.65), calcium (412.41±253.79) and selenium (26±12.93). There was significant difference ($P < 0.001$) between mean intake of all nutrients at baseline and after intervention at 95% confidence level. Pre-intervention stunting was 36.5%, wasting 34% and underweight 30.8%. Wasting and underweight reduced significantly ($P= 0.001$) after intervention but not so for stunting ($P= 0.083$).

Conclusion: The findings indicated that dietary intake and morbidity are significant predicators of nutritional status of HIV infected children. It is recommended that public awareness and education on the nutritive value and nutritional benefits of amaranth grain be promoted by nutritionists. Sensitization of the consumption of amaranth grain need to be upscaled by nutritionists and other care providers of persons infected with HIV and AIDS.

Keywords: Amaranth grain supplementation; Nutrient intake adequacy; Morbidity; Nutritional status; HIV infected children

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Introduction

HIV and AIDS is a public health and socio-economic problem in many countries in the Sub-Saharan Africa where it is a major cause for morbidity and mortality [8]. Morbidity and mortality related to human immunodeficiency virus (HIV) infection in the developing world remain unacceptably high, despite major advances in HIV therapy and increased funding internationally for care. A major contributing factor is the fact that over 800 million people remain chronically undernourished globally. The HIV epidemic largely overlaps with populations' already experiencing malnutrition [1]. In Sub-Saharan Africa, where more than 22 million people are living with HIV/AIDS, malnutrition and food insecurity are endemic [9]. Kenya like other countries in the Sub-Saharan region is severely affected by HIV and AIDS. According to the Kenya 2007 HIV and AIDS Estimates Report, the number of adults and children living with HIV and AIDS was estimated at 1,643, 065 by the end of 2009 [10]. The report indicates a national adult (15+) rate of 6.5%. Kenya has an estimated burden of close to 1.2 million orphans and vulnerable children (OVC) directly related to HIV and AIDS mortality [11]. HIV and AIDS is both a cause and a consequence of wide spread hunger and malnutrition in Sub-Saharan Africa [12]. This is why the World Health Organisation (2008) [13] urges a renewed focus on nutrition as fundamental part of comprehensive package of care for people with HIV/AIDS at country level [12,13]. Combating under nutrition and HIV and AIDS are two of the eight United Nations Millennium Development Goals to be achieved by 2015 [2,3].

Food and nutrition interventions are critical components of comprehensive responses to the HIV pandemic [4-6]. Provision of high quality and adequate food is a significant challenge to the caregivers due to financial constraints, inability to access adequate amounts of food and low diversibility of the diets [4]. A diverse and adequate diet is fundamental for better health for people living with HIV and AIDS [7]. To diversify the food base, there is need to emphasize on utilization of underutilized nutritious food crops like the amaranth grain. The amaranth grain has a unique composition of protein, carbohydrates and lipids. Along with the protein, amaranth provides a good source of dietary fiber and minerals including iron, zinc, magnesium, phosphorous, copper and manganese [14]. The food value of grain amaranth was recognized by people from Mexico, Peru, and Nepal long before any nutritional analyses were conducted [15]. Grain amaranth was very popular for its healing effect, nutritional value and easy to digest.

Childhood malnutrition is a major public health problem throughout the developing world [8]. The treatment of HIV-positive children is frequently complicated by high rates of acute malnutrition [16]. The effects of malnutrition on children infected with HIV and AIDS are more serious due to the fact the children are trying to keep up to the demands of normal growth and development in addition to the demands of achieving and maintaining a strong immune system [4,7,16,17]. The requirements for energy dense and high quality protein is high in children living with HIV and AIDS due to the high rate of metabolism and the need to boost, strengthen and maintain the immune system [4,7,16,18]. Whereas, the energy requirements can be met by utilizing the easily available and cheap cereals, meeting the protein requirements is a challenge since the cereals have low protein and are “unbalanced” in terms of essential amino acid composition. They are limited in the essential amino acids like lysine that are essential for optimum growth and health [14,15].

The main sources of high quality protein are animal foods, which are relatively expensive and sometimes it is difficult for the care providers to provide for the protein requirements of the HIV and AIDS infected children adequately due to financial constraints. The financial cost of care to individuals also has an important effect on HIV care in resource-constrained environment and development of evidence–based programmatic solutions is essential [19]. There is need, therefore, to explore other available alternatives of enhancing intake of high quality protein for the vulnerable groups of people. The grain amaranth is a nutritious food source and a promising alternative grain for the modern diet [20]. Although the nutrition quality of amaranth grain in other countries has long been established, it is an underutilized crop in Kenya and yet it has the potential to broaden the food base, enhance diet diversification and reduce the levels of malnutrition [21]. This potential is compounded by the lack of sufficient information on the nutritional value of amaranth grain for the vulnerable groups of people such as HIV and AIDS infected children.

Targeted food and nutrition assistance to individuals with HIV infection and their families has the potential to improve nutrition and the course of HIV disease in developing countries. The main goals of nutrition intervention for HIV-infected children are 1) promote optimal growth and development, 2) prevent malnutrition, 3) enhance quality of life by providing adequate energy and nutrients and 4) increase resistance to infections [22].

There is growing scientific consensus that food sufficiency is a critical component of treatment of both malnutrition and malnutrition-mediated disease outcomes and that sufficiency requires close attention to diet quality not merely quantity. Several food and nutrition interventions are ongoing but few data exist to help guide the development of effective programmes that integrate HIV care and nutrition. There is urgent need to evaluate the efficacy of locally appropriate, sustainable food-based strategies on nutritional status and the potential impact of improved nutritional status on the disease progression. This study involved complementing the diets of the HIV and AIDS infected children with amaranth grain porridge for six months and assessing the effects on the nutrition status of the children. Amaranth grain is nutrient dense yet it is underutilized in Kenya [23]. It has the potential of not only broadening the food base but also improving the quality of diets which is critical for the nutritionally vulnerable groups like HIV and AIDS infected children.

The evidence base evaluating the benefits of nutrition interventions in developing countries has been limited to efficacy studies of micronutrient supplementation and more recently, specialized ready-to-use foods [24]. Two recent reviews on the effects of macronutrient supplementation (with or without nutritional counselling) on various clinical outcomes of people living with HIV offer inconclusive evidence of the positive impact on weight gain and CD4 count in developing countries [25,26]. Recent published studies that evaluated the impact of macronutrient supplementation to HIV infected individuals in resource-constrained setting include a quasi-experimental study in Zambia [27]. According to the study, food supplementation was associated with better adherence to ART, after adjusting for age, sex, baseline CD4 count, WHO stage and haemoglobin. In a randomized controlled trial from Malawi, comparing supplementary feeding with a ready- to- use fortified spread compared to corn-soy blended flour with similar energy composition, patients receiving fortified spread had greater increase in BMI and fat-free body mass than those receiving corn-soy blend [28]. In this study, the association between amaranth grain flour supplementation and adequacy of nutrient intake, nutritional status and morbidity of the study children was analysed.

Objectives

i. Determine the pre and post dietary intake of HIV and AIDS infected children attending the comprehensive care clinic at Thika District Hospital, Kenya

ii. Determine the pre and post nutritional status of HIV and AIDS infected children attending the comprehensive care clinic at Thika District Hospital, Kenya

iii. Establish the prevalence of illness among the HIV and AIDS infected children attending the Comprehensive care clinic at Thika District Hospital at pre and post intervention

iv. Determine the impact of amaranth grain consumption on nutrient intake and nutritional status among HIV and AIDS infected children attending the comprehensive care clinic at Thika District Hospital, Kenya.

Methods

Study design and subjects

The study was a longitudinal experimental study with a pre-test post-test single group design [4,29]. This type of design is used when the available study sample is small or when a researcher is not able to get a matching control group so that each person becomes his/her own control. The design compares outcomes in population before and after the implementation, with statistical treatment of determinants and known confounding factors [4]. The study design was appropriate since the sample frame was small [4,29].

Study site

The study was conducted at Thika District Hospital Comprehensive Care Clinic. Thika District is one of the seven districts in the Central Province of Kenya which had the highest (34%) HIV and AIDS prevalence in the province KDHS [30]. The Thika District Hospital provides healthcare services to the entire district and to the neighbouring districts like Machakos.

Target group

The target population was children 2-5 years old infected with HIV and AIDS, registered and attending the comprehensive care clinic at Thika District Hospital. Children under five years old are nutritionally a vulnerable group. The 2-5 years age group was zeroed in by taking into consideration the HIV infection diagnostic challenges in infants and young children. HIV infection is often difficult to diagnose in younger children since the readily available diagnostic tests rely on detection of antibodies to the HIV virus. The tests are not reliable in infants and children below eighteen months because of the persistence of trans-placentally acquired maternal antibody [31]. Children born to infected mothers have antibodies to HIV made by the mother's immune system that crosses the placenta to the baby's blood stream before birth and persists for up to eighteen months. Hence this study included children in the age group of 2 -5 years old.

Sample Size

This was a clinic based study and the sample size was based on the number of 2-5 years old HIV/AIDS infected children registered and regularly attending the Comprehensive Care Clinic. The sampling frame comprised 55 HIV and AIDS infected children (2-5 years old) registered at the Comprehensive Care Clinic within the first three months of the study. The entire sampling frame was included due to its small size. However, by the end of one month, three orphans were relocated upcountry and thus the final sample was 52 HIV/AIDS infected children. There were no other dropouts during the study period of six months.

Determination of pre and post nutrient Intake of the Children

The dietary assessment consisted of a repeated 24hour dietary recall through face to face interviews. Dietary data from two consecutive interviews (one week apart) were collected at baseline and at month six of the intervention. The caregiver was asked to state all the foods and drinks that the child had taken in the previous day starting from the time the child woke up to the time the child went to sleep. The respondent was then asked to state the quantities of each food and drink taken by the child. Household measures such as cups, bowls and spoons were used to estimate quantities of foods consumed. Quantities were recorded according to the amount of a particular bowl. In case of combined foods the respondents were asked to estimate the individual food constituents. Quantities of foods consumed were estimated using household measures and food models. The values of these measurements were then converted to grams. Using the food composition tables [32] and Nutrisurvey software (1999) foods consumed were converted into nutrients consumed per day by averaging the two recalls of one week apart at baseline and at month six. The amount of kilocalories, protein, calcium, iron, zinc, vitamin A and vitamin C consumed by the children was established and then compared to the RDAs to establish adequacy of consumption.

Determination of nutrition status

Nutrition status of the children was determined by anthropometry. Anthropometry is widely recognized to be an important tool for assessing children's nutritional status [2]. Weight for height is particularly sensitive to short-term growth changes as influenced by various factors such as food intakes and illness. It represents a current estimate of nutritional status and can exhibit considerable variations over short periods of time. In this study, weights and heights of the children were measured monthly for a period of six months by the researcher and two trained research assistants. A bathroom scale and height board were used for measuring weight and height respectively. For weight, the weighing scale was calibrated to zero before weighing a child and recalibrated after every measurement. A child was asked to stand on the scale with minimal clothing and then the weight was recorded to the nearest 100g. For height, a child was asked to stand straight along the board with the feet parallel to the moveable board; the sliding board was then moved to compress the hair and the reading taken to the nearest centimetre. Both the height and weight were taken twice at each visit and an average computed to ensure accuracy of measurement. Anthropometrical data were analysed by use of the EPI INFO software. The data were transformed into to Z-score and medians of percentiles. This was used to determine the nutritional status of the children in terms of those who were normal, stunted, wasted and underweight. Those with Z- score of less than (<) -3 SD based on their weight for height, height for age and weight for age were classified as severely malnourished. Those who had -2.99 SD to -2 SD were classified as moderately malnourished while those with Z-score of more than (>-2 SD) were classified as normal. There no overweight and obese case in the sampled children.

Morbidity prevalence

Morbidity characteristics focused on prevalence of opportunistic infections and illnesses. The information obtained by enquiring from the caregiver and confirming with the clinic card. Morbidity was summarized as periodic prevalence using time sampling of 2 weeks per given month. Morbidity data were collected for two weeks every month for six months. The caregiver was asked to state the illness (es) the child suffered two weeks prior to the time of the visit. This was then confirmed by cross checking the child's clinic/hospital card.

Data analysis

Paired t-test was run to compare nutrition status at baseline and at the end of the six months intervention period. Further Pearson product moment correlation co-efficient (r) value was calculated to test the statistical association and differences between nutritional statuses of the children and diet and other dependent variables. Regression analysis was done to determine the associations between the independent variable of diet (kilocalorie and number of meals) and the confounding factors (the number of illness, frequency and CD4 counts). The continuous outcome (nutrition status) coefficients with corresponding 95% confidence interval were used to assess the significance and magnitude of the effect of a given predictor. The variables that showed a significant relationship in bivariate analysis were subjected to regression analysis in order to establish predictors of nutrition status. The variables that were measured during the study included kilocalorie intake, number of meals, number of illness and frequency of illnesses.

Results

Mean intake of selected nutrients in relation to RDA at pre- and post- intervention

The mean of consumed amounts of classified foods and nutrients was calculated and pre- and post- intervention data was obtained. At Pre-intervention, the mean intakes of total kilocalories, vitamin A, selenium and calcium were inadequate with reference to the FAO/WHO recommendations for the HIV infected children (2 -5 years old). The mean intakes for protein, iron, zinc and vitamin C were within or above the recommended levels. The mean consumption of the nutrients by the children as at post-intervention was also calculated and the results are shown in Table 1.

Table 1: Mean intake of selected nutrients in relation to RDA at pre and post- intervention.

	Pre- Intervention		Post- Intervention			*P*-Value Paired T-Test
Nutrients	Mean	Std. Dev.	Mean	Std. Dev.	RDA (FAO/WHO)	
Energy (Kcal)	1281.10	379.69	1607.72	379.67	1550 - 1860	< 0.001
Protein (g)	39.30	16.48	53.46	16.49	26	< 0.001
Calcium (mg)	412.41	253.79	434.41	253.80	500 - 600	< 0.001
Iron (mg)	26.57	15.53	36.57	15.54	6	< 0.001
Vitamin A (µg RE)	268.35	216.65	428.35	216.60	400 - 450	< 0.001
Vitamin C (mg)	49.01	36.05	59.92	36.06	30	< 0.001
Zinc (mg)	6.50	2.36	8.1	2.37	4.1-5.1	0.022
Selenium (µg)	26.82	12.93	30.19	12.94	60-73	0.187

The total kilocalorie intake increased after the intervention and the mean intake was within the FAO/WHO recommendation. The mean intake of vitamin A also improved and was within the recommended values. However, though the mean intake of calcium and selenium increased at post intervention, the mean intakes were still below the FAO/WHO recommendation. Based on the paired t–test results, there was significant difference (P < 0.0001) between mean intake of kilocalories, protein, calcium, vitamin A, vitamin C and P= 0.022 in the case of zinc at baseline and after intervention at 95% confidence level. The results indicate a positive impact of amaranth grain consumption by the children. The increase in the mean intake of selenium was minimal during intervention and the difference in pre- and post-intervention mean intakes was not significant probably due to inadequate consumption of other foods rich in selenium.

Pre and post nutrition status of the children

The nutrition status of the children was assessed by comparing the prevalence of malnutrition at baseline and the end of the intervention based on the indicators Z-scores. At baseline, slightly more than a third (36.5%) of the children were stunted which slightly more than the national figure (31.0%) is according to the KDHS, [30] and the 35% according to the KDHS [33] preliminary report. The level of wasting was at 34.6% which is higher from the national figure of 6%, and the 7% according to the 2008 KDHS preliminary report. Underweight was at 30.8% and is also higher

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than the national figure of 4.0% [30] and the 16% according to the 2008 KDHS preliminary report.

The wide variations in wasting and underweight levels compared to the national levels may be associated with the fact that many children with HIV infection do not gain weight or grow normally [31]. HIV- infected children are frequently slow in reaching important milestones in motor skills and mental development [30]. In addition, HIV-infection complicates utilization of nutrients in addition to the dramatic metabolic changes that accompany the disease. These may in turn compromise the normal growth process of the infected children [4]. The findings agree with a study in South Africa that found higher prevalence of underweight among HIV-infected children compared to the average national percentages in a national survey [34]. This study established the presence of both chronic and acute malnutrition among the HIV and AIDS infected children attending the Comprehensive Care Clinic at Thika District Hospital at baseline. However, more than two thirds of the children were found to be within the normal height for age, weight for height and weight for age at 63.5%, 65.4% and 69.2% respectively.

After intervention, prevalence of wasting was at 21.2%, underweight at 17.3% and stunting at 32.5%. The study revealed improvement in the nutrition status of the children. The prevalence of the wasting, underweight and stunting among the children reduced after intervention. The levels of wasting reduced from 34.6% at baseline to 21.2%, after intervention, underweight from 30.8% at baseline to 17.3% and stunting from (36.5%) at baseline to 32.5% after intervention (Table 2). More than two thirds of the children were found to be within the normal height for age, 78.8% within the normal weight for height and 82.7% within the normal weight for age. The Figure 1 shows the comparisons of the pre- and post- intervention and national figures. Though the levels of wasting and underweight among the children reduced after intervention, the levels are still much higher than the national figures.

Table 2: Prevalence of malnutrition status at baseline and Post Intervention (N=52).

Z-Scores	Status	Baseline N=52		Post-Intervention N=52	
		n	%	n	%
Height for age					
< -3SD	Severe	5	9.6	4	7.7
-2.99 to -2.0SD	Moderate	14	26.9	13	25
>-2SD	Normal	33	63.5	35	67.3
Total stunted		19	36.5	17	32.7
Weight for height					
< -3 SD	Severe	6	11.5	3	5.8
-2.99 to -2.0SD	Moderate	12	23.1	8	15.4
>-2 SD	Normal	34	65.4	41	78.8
Total wasted		18	34.6	11	21.2
Weight for age					
< -3SD	Severe	5	9.6	2	3.8
-2.99 to -2.0SD	Moderate	11	21.2	7	13.5
>-2SD	Normal	36	69.2	43	82.7
Total underweight		16	30.8	9	17.3

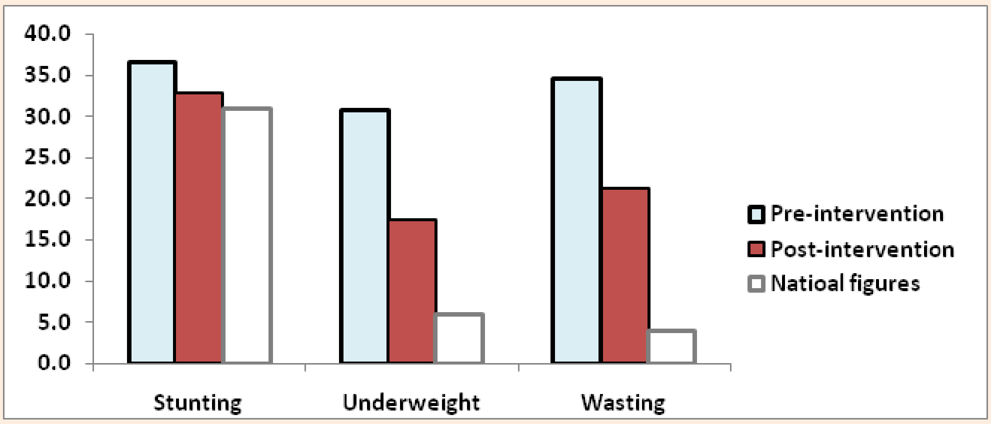

Figure 1: Comparisons for pre- and post- intervention status and national figures.

Trends in Nutrition status over the six months study period

The trends in wasting using the mean weight for height among the study children over the study period was generated and is as shown on Figure 2. Generally there was an upward trend in mean weight for height during the six months study period indicating a reduction in wasting hence improved nutrition status. Weight for height is an important indicator of the health and nutrition status of the HIV/AIDS infected children as literature indicate that children with HIV infection do not gain weight or grow normally [30].

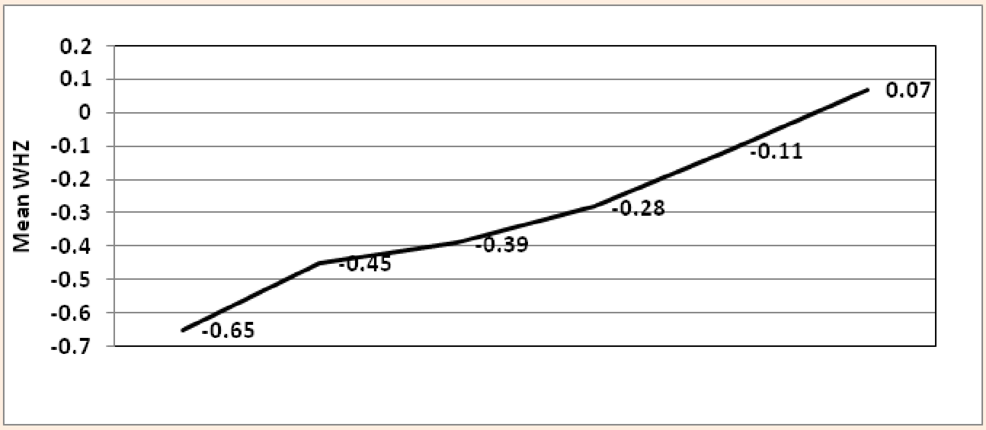

Figure 2: Monthly trends in mean weight for height (WHZ) of the study children.

Contribution of amaranth consumption to nutritional status of the children

The paired sample t-test shows that the level of wasting and underweight reduced significantly (P= 0.001 and P = 0.001) (Table 3) respectively, indicating a positive impact of diet complementation with amaranth porridge on the nutritional status. However, in the case of stunting, there was no significant difference (P= 0.083) between pre- and post- intervention. The six months study period was not long enough to experience big changes in terms of height. Wasting was therefore used as the main indicator of nutritional status.

Table 3: Difference of pre and post nutrition status.

	Paired Differences					
Indicator	**Mean-1**	**Mean-2**	**Mean**	**SD**	**95% CI**	***P*- Value**
Weight for height	2.5385	2.7308	-.1923	.39796	[-.3031] - [-.0815]	0.001
Height for age	2.5385	2.5962	-0.577	.235	[-.1232] - [.0079]	0.083
Weight for age	2.5962	2.7887	-.1925	.39796	[-3031] - [-.0815]	0.001

Correlations between selected variables and nutrition status (WHZ)

Nutritional status can be influenced by various factors. This study established the relationship between nutritional status using weight for height and kilocalorie intake, number of meals, number of illnesses suffered and the frequency of illnesses during the study period. Using Pearson correlation analysis, the associations between variables were determined and the results for r-value and statistical significance are shown on table 4.

Table 4: Correlations between selected variables and nutrition status (WHZ).

Variable	r- value (n=52)	*P* - value
Kilocalories	0.47	0.030
Number of meals	0.26	0.042
Number of illness	-0.24	0.045
Frequency of illness	-0.21	0.044

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There was moderate positive relationship (r =0 .47) which was significant at (P= 0.030) between kilocalorie intake and nutritional status. This shows that increase in the amount of the kilocalorie consumed, led to better nutritional status based on weight for height. There was weak positive relationship (r =0.26) which was significant at (P= 0.042) between the number of meals consumed per a day and nutritional status. This shows that the more the number of meals, the better the nutrition status in terms of weight for height. There were weak negative relationships (r = -0.21) and (r = -0.24) between the number of illness and the frequency of illnesses and nutritional status respectively. This shows that the more illnesses and the more frequent the illnesses one suffers, the lower the nutritional status based on weight for height.

The results on table 5 indicate significant associations (P <0.05) between kilocalorie intake, number of meals, number of illnesses, frequency of illnesses and nutritional status. The amount of kilocalories consumed contributed to nutritional status by 22.09% and this was significant (P= 0.031). The number of meals consumed contributed to 6.8% of the nutritional status and was significant (P= 0.042). Number of illnesses contributed to 5.76 % of the nutritional status significantly (P= 0.045) while the frequency of the illnesses contributed to 4.44% of the nutritional status of the children significantly (p= 0.044).

Table 5: Contributions of selected variables to nutritional status (WHZ) at Post –Intervention.

Simple Linear Regression	R^2	%	Std. Error of the Estimate	*P*- Value
Kcal	0.2209	22.09	1.39800	0.031
Number of meals	0.068	6.8	1.51892	0.042
Number of illness	0.0576	5.76	1.51954	0.045
Frequency of illness	0.0441	4.44	1.52050	0.044
Multiple Linear Regression				
Kilocalories, number of meals, number of illness and frequency of illness	0.383	38.3		0.043

The results show that the kilocalorie intake, the number of meals, number of illnesses, and frequency of illnesses all contributed to 38.3% of the nutritional status and the contribution was significant (p=0.043). The rest (62%) could be due to other factors like birth weight, nature of caregiver, feeding practices, medical treatment hygiene and sanitation, physical activity, disease progression and socio-psychological factors that were not captured in this study [35]. The significant association between the kilocalorie intake and number of meals agrees with the findings of a number of studies which state that adequate caloric intake and increased appetite contribute significantly to reduced loss of body mass (wasting) which in itself is a significant risk factor for HIV and AIDS related mortality [36,37].

The significant association between number of illnesses and frequency of illnesses also agrees with findings of some studies which state that infections of any type put a physical and physiological stress on the body systems by reducing the efficiency of nutrient absorption and utilization [38,39]. These studies showed that both decreased food intake and chronic diarrhoea were significantly associated with poorer mean WAZ score (p<0.05). The importance of nutritional status in HIV and AIDS patients is well-known and has been widely documented. This study shows the association between caloric intakes, number of meals, number and frequency of illnesses and nutritional status, indicating that diet and morbidity are significant predicators of nutritional status of the HIV infected children.

Conclusion

The intake of food by the children infected with HIV and AIDS at the Comprehensive Care Clinic Thika District Hospital was low as indicated by inadequate mean intakes of total kilocalories, vitamin A, selenium and calcium with reference to the FAO/WHO at baseline. This is probably due to poor appetite among the children, poor utilization and inadequate provision of food that supplies the nutrients. The total kilocalorie intake increased after the intervention and the mean intake was within the FAO/WHO recommendation. The mean intake of vitamin A also improved and was within the recommended. However, though the mean intake of calcium and selenium increased at post-intervention, the mean intakes were still below the FAO/WHO recommendation. Need for continued nutrition education to care givers of children infected with HIV and AIDS. The kilocalorie intake and number of meals had a significant positive relationship with nutrition status of the children.

The nutritional status of the HIV and AIDS infected children attending the Comprehensive Care Clinic at Thika District Hospital was poor as depicted by the high levels of wasting, underweight and stunting. The levels of wasting and underweight among the HIV and AIDS infected children reduced significantly after intervention but were still higher than the national figures. There were significant associations between the kilocalorie intakes, number of meals, number of illnesses, frequency of illnesses and the nutritional status. Dietary profile (kilocalorie intake and number of meals) and morbidity (number and frequency of illnesses) were significant contributors to the nutritional status of the study children.

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