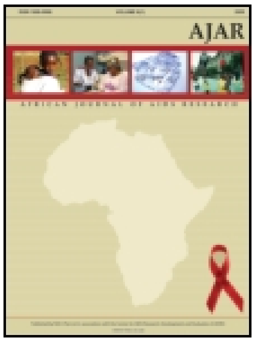

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Food consumption patterns, diversity of food nutrients and mean nutrient intake in relation to HIV/AIDS status in Kisumu district Kenya

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As the causes and consequences of the AIDS epidemic become clearer, so does the fundamental importance of food and nutritional security for HIV-affected individuals. Even as food insecurity remains a major problem in poor households, its effects are worsened in disease states like HIV infection. Food deficiency and nutritional inadequacy compromise an individual's physical status and work capacity, and may also diminish their resource base and household provisioning. The prevalence of HIV and AIDS in Kenya threatens food production systems, which intensifies poverty, increases the nutritional implications for HIV-infected individuals, accelerates the rate of orphanhood beyond what existing social networks can cope with, and basically affects all indicators of socio-economic development in the country. This cross-sectional study sought to assess food and nutrient intake in HIV-affected versus non-HIV-affected households. Purposive sampling was used to select 160 households (77 HIV-affected households and 83 non-HIV-affected households) in Kisumu district, a lowland area along Lake Victoria. A consolidated questionnaire that included a food-frequency checklist and personal 24-hour dietary recall was used to gather information from 40 households. The data were analysed quantitatively; descriptive statistics were mainly measures of central tendency, and inferential statistics involved chi-square tests and independent *t*-test samples. A table depicting food composition was used to compute the nutrient intake of each household. The findings reveal a significant relationship between a household's HIV/AIDS status and nutrient intake.

Keywords: diet, food availability, food production, food security, households, nutritional status, sub-Saharan Africa

Introduction

The ability of households and communities to ensure their food and nutritional security is being severely challenged by the HIV epidemic. Livelihoods may be eroded through the effects of illness or premature death, thereby affecting households' labour capacity and fracturing the transfer of intergenerational knowledge about food and nutrition. In 2007, more than 33 million people worldwide were living with HIV, a reduction of 16% compared with the estimate of 39.5 million published in 2006 (UNAIDS/WHO, 2006). However, the annual toll of AIDS deaths in sub-Saharan Africa continues to grow, despite progress in some countries. An estimated 1.4 million adults in Kenya are infected with HIV, with HIV prevalence estimated at 7.4% for the country and 11.5% for Kisumu district (National AIDS Control Council, 2007).

The HIV epidemic continues to have a major impact on people's food and nutrient security, which perpetuates underdevelopment. Individuals' nutritional status is the ultimate measure of food security. HIV and AIDS is predicted to have a long-term impact on food security in sub-Saharan Africa as it affects each main dimension of the food-security continuum (FAO, 2001). The nutrient quality of one's diet improves with consumption of greater food diversity; however, access to food becomes more difficult in households where one or more of the productive members can no longer bring in an income (Shimbo, Kimura, Imai, Yasumoto, Yamamoto, Kawamura *et al*., 1994; Slattery, Berry, Potter & Caan, 1997; Hatloy, Torheim & Oshuag, 1998; Gillespie & Kadiyala, 2004).

The adverse effects of HIV or AIDS on an individual's nutritional status occur while the body simultaneously needs the best possible nutrition. This often results in accelerated weight loss, malnutrition, and wasting; frequent bouts of diarrhoea along with other infections that characterise AIDS will have a dramatic impact on the individual's ability to utilise the food they consume (FAO, 2001). Adequate nutrition cannot cure HIV infection, yet it is an essential part of maintaining the infected individual's immune system and physical activity and thereby achieving optimal quality of life. The replenishment of macronutrients and micronutrients is an essential intervention for people living with HIV or AIDS to mount an effective immune response to fight opportunistic infections; furthermore, good nutrition is required to optimise the benefits of antiretroviral treatment (ART) and may significantly lengthen the period between HIV infection and the onset of active illness (Catholic Relief Services & USAID, 2006).

HIV and AIDS has significant impacts on nutrition at the levels of the individual, household and community. In households affected by HIV or AIDS, overall food consumption generally decreases. For the individual, malnutrition will increase both susceptibility to HIV infection and vulnerability to various post-infection impacts (Friis, 1998). HIV or AIDS and malnutrition often operate in tandem. Poor nutrition increases the risk and progression of disease, and, in turn, disease exacerbates malnutrition (Friis, 1998). Thus, malnutrition and HIV infection or AIDS illness can form a vicious cycle where under nutrition increases the susceptibility to opportunistic infections and consequently worsens the severity of HIV disease, which results in a further deterioration of nutritional status. Even when a person is not yet showing symptoms of disease, infection with HIV may impair their nutritional status (Piwoz & Preble, 2000; Committee on World Food Security, 2001).

The impact of HIV and AIDS on nutritional status

HIV and AIDS negatively impact the nutritional health of an individual by changing the body's metabolism so that more energy, protein, and micronutrients are demanded and utilised. HIV and AIDS impair the absorption of nutrients consumed on account of diarrhea and vomiting, damaged intestinal cells, and other effects of opportunistic infections. Protein-energy malnutrition compromises all aspects of the human immune system: cell-mediated immunity, antibody production, the acute-phase response and the protective integument. HIV infection eliminates effective T-cell function. When malnutrition and HIV infection occur together the immune compromise is compounded, as the two conditions synergistically work to make the individual more susceptible to other infections and make the infections that occur more severe. A study in Gambia showed increased risk of death for HIV-infected adults with a low body mass index (BMI) (<18 kg/m^2), even after controlling for their CD4 cell count and other risk factors (Gillespie & Kadiyala, 2004; Sande, 2004). Micronutrients, including vitamins A, B, C and E and iron, zinc and selenium, also affect the immune system and bolster resistance to opportunistic infections (Friis, 2005). HIV infection affects malnutrition in the individual through multiple mechanisms, including increased energy requirements, reductions in dietary intake, nutrient malabsorption and loss, and metabolic changes. The increase in energy requirements occurs even during the asymptomatic infection and when a person may not know they are infected (WHO, 2003). HIV-infected individuals have higher nutritional requirements than what occurs normally, particularly with regard to protein (up to 50% increased need) and energy (up to 15%); they are also more likely to suffer a loss of appetite, even anorexia, thus reducing their dietary intake at the very time when nutritional requirements are relatively high (Friis, 2005).

There is increasing evidence that vitamin and mineral deficiencies may play an important role in HIV transmission and progression for a number of reasons. Notably, HIV-patients are under oxidative stress from the infection and loss of CD4 cell counts while a number of micronutrients are required for fighting infection (Schwarz, 1996; Grimble, 1998; Nimmagadda, O'Brian & Goetz, 1998; Semba, 1998). Also, a number of HIV-associated clinical conditions decrease the individual's appetite while other conditions increase the body's demand for nutrition (Timbo & Tollefson, 1994; Macallan, 1993; WHO, 2003). Some studies have reported an association between low micronutrient level and faster HIV-disease progression. While a low serum or plasma vitamin A level has been described as a risk factor for mortality during HIV infection, a high intake of micronutrients has been associated with reduced progression to AIDS illness and improved survival (Macallan, 1993; Tang, Graham & Kirby, 1993; Semba, Miotti, Chiphangwi, Chiohangwi, Liomba, Lang *et al*., 1995). Other studies have shown that the normalisation of plasma levels of zinc and selenium to be associated with decreased disease progression and HIV-related mortality (Tang, Graham & Saah, 1996;

Baum, Shor-Posner, Lai, Zhang, Lai, Fletcher *et al*., 1997). In a controlled study of HIV patients, the average viral load was approximately 1.0 log copies/ml lower in the group of patients receiving vitamin supplements; this compares favourably with the reduction in viral load obtained when using a single ARV for 12 weeks (Baum *et al.*, 1997; Mostad, Overbaugh, De Vange, Welch, Chohan, Mandaliya *et al*., 1997).

Good nutrition is important for disease resistance and may improve the quality of life of patients with AIDS illness. The onset of AIDS itself, along with secondary disease or death, might be delayed in individuals with good nutritional status. Nutritional care and support may help prevent the development of nutritional deficiencies, loss of weight and lean body, and thereby maintain the patient's strength, comfort level, level of functioning and self-image (Committee on World Food Security, 2001). Weight loss and wasting in PLHIV is caused by reductions in food intake, nutrient malabsorption and metabolic alterations. Several vitamins and minerals are critical for fighting HIV infection because they are required by the immune system and major organs to fight infectious pathogens (Piwoz & Preble, 2000). The chance of infection with HIV might be reduced in individuals who have a good nutritional status — with micronutrients and especially vitamin A playing a significant role (Administrative Committee on Coordination/ Standing Committee on Nutrition [ACC/SCN], 1998). At the same time, the onset of symptomatic HIV disease and even death might be delayed in the well-nourished HIV-positive individual (ACC/SCN, 1998). Diets rich in protein, energy and micronutrients can help the body develop resistance to opportunistic infections among patients with AIDS (Friis, 1998).

Study setting

This study was conducted in East Kolwa location, Winam Division of Kisumu district, Nyanza Province, Kenya. The district covers a total area of 1 177.5 km^2, of which 918.5 km^2 is arable land and 259 km^2 is occupied by water mass. The district lies in a depression that is part of a large lowland area on the Nyanza Gulf, along Lake Victoria. Inhabitants' main occupation is subsistence farming, combined with other income-generating activities, such as basket and mat weaving, fishing and trading in fish products. The inhabitants also deal in small-scale businesses, such as small retail shops and food kiosks. The target households were derived from East Kolwa location, which comprises three sub-locations: Chiga, Mayenya and Buoye. Buoye sub-location was purposively selected as the study area due to the burden of HIV and AIDS in the area and limited resources. Besides HIV and AIDS, the area also faces the challenges associated with malaria, which also increases households' expenditure on healthcare and drugs, thus reducing individuals' work capacity and decreasing households' food security. Inter-censal estimates by AMREF (2003) gave the population of Buoye sub-location as 5 068 and the number of households as 1 667.

Methods

Data collection

The study was a cross-sectional community-based survey of households in East Kolwa location of Kisumu district. A sample size of 160 households was purposively selected for the study: 77 HIV-affected households and 83 non-HIV-affected households. This difference arose due to Buoye sub-location having more non-HIV-affected households. The study was conducted from October to December 2005. The unit of analysis used was the household. The study targeted HIV-affected households, which were defined as households having have person(s) living with HIV or AIDS or who were currently experiencing an active phase of HIV infection, or households that had lost a member due to HIV-related illness, or households with members living with AIDS-related orphanhood, or child-headed households.

The respondents (males and females) were the caregivers from the index households who provided information on selected variables of the study, such as income, age, religion and livelihood activities. Data was collected with the help of a consolidated interview schedule questionnaire, administered to one member of each of the 160 household sample, and who played a major role in food provision. The interview schedule was used to collect information from the caregiver of the index household, who was the respondent. The data collected included demographic and socio-economic information, food-consumption patterns, food availability and food accessibility. This yielded data on the respondents' dietary intake, food production and food-consumption patterns. The study adopted a shortened 24-hour dietary recall developed by Maxwell & Frankenberger (2005), which was used to determine the overall food and dietary intake for each of the households. The 24-hour dietary recall was administered to 40 households and this may bias the diet information and therefore its application to other populations should be made with caution. A food-frequency checklist was used to collect information on food items or food groups consumed by the index household. This was used to measure the pattern of food intake and diversity.

Data analysis

The Statistical Package for Social Sciences Version 12 was used to enter and analyse the data at a 95% level of confidence. The data analysis was done quantitatively: the descriptive and inferential statistics were applied during analysis and interpretation. The chi-square test was used to establish whether there was an association between HIV/AIDS status and diversity of food nutrients, and a *t*-test was used to establish any significant differences in the mean nutrient intake.

Ethical consideration

The principal researcher obtained a letter of introduction from Maseno University and a research permit from Kenya's Ministry of Education, Science and Technology. The local chief and sub-chief were informed and briefed on the research objectives, procedures and the requirements. The researcher sought the consent of the respondents, who were briefed on the research procedures and benefits and assured of confidentiality. Each respondent was selected upon consent, considering that the study could only work with volunteers due to its sensitivity.

Results

Socio-demographic characteristics of households

A total of 160 households from Buoye sub-location were included in the study. Of these, 83 (52%) were non-HIV-affected households and 77 (48%) were HIV-affected households. The total number of non-affected households finally included in the study (chosen through simple random sampling) was 77 to match the number of affected households. Demographic characteristics of the caregivers of the index households, including age, marital status and religion, are shown in Table 1. The majority of the respondents from affected households were aged 50 and above; in the non-HIV-affected households, the majority were between ages 30 and 49 years. All the respondents were Christians. There was a minimal difference between the two groups in the level of education attained by the respondents, except for the frequency of university education, which was 13.7% of the respondents from HIV-affected households versus 1.2% of the respondents from non-HIV-affected households (Table 1).

Prevalence of HIV/AIDS in the affected households

Among the HIV-affected households, those with PLHIV who were still alive were 26% and those with members who had died were 74%. These proportions may be attributed to the high cost of medications, which households may not cope with, thus resulting in individuals succumbing to HIV-related illnesses.

The caregivers of the index households were wives, husbands, daughters, sons and other relatives of PLHIV (see Table 1). In households where the caregivers were husbands, 5.5% had wives affected by HIV or AIDS; where the caregivers were wives, 32.5% had husbands who were affected. Where the caregivers were a mother or father, 35.1% had sons living with HIV and 20.8% had other types of relatives living with HIV (e.g. daughter-in-law, son-in-law). The majority of PLHIV in the households were males.

Socio-economic characteristics of the index households

The information gathered on socio-economic characteristics of the index households related to occupation, income levels, land size and agricultural activities, as well

Table 1: Socio-demographic characteristics of the respondents (i.e. caregivers in the index households) (*n* = 154)

	Non-HIV-affected households *n* (%)	HIV-affected households *n* (%)
Age (years):		
≤17	1 (1.2)	0
18–29	23 (27.7)	13 (16.9)
30–39	33 (39.8)	30 (39)
40 and above	26 (31.3)	34 (44.2)
Marital status:		
Single	0	1 (1.3)
Married	52 (67.5)	31 (40.3)
Divorced	1 (1.3)	2 (2.6)
Widowed	27 (31.2)	43 (58.8)
Education level:		
None (no education)	21 (25.3)	19 (24.7)
Primary	46 (55.4)	44 (57.1)
Secondary	13 (15.7)	11 (14.3)
Middle-level college	2 (2.4)	2 (2.6)
University	1 (1.2)	1 (1.3)

Respondents' relationship to household member living with HIV or AIDS (*n* = 77 HIV-affected households):

Caregiver of index household	Relationship to PLHIV	Prevalence *n* (%)
Wife	Husband	25 (32.5)
Husband	Wife	4 (5.5)
Mother/father	Son	27(35.1)
Mother/father	Daughter	5 (6.5)
Mother/father	Other relative	16 (20.8)

as non-agricultural activities such as small businesses, for example fishing, basketry, and charcoal burning.

In the non-HIV-affected households, 72.3% of the respondents earned a monthly income of less than Kshs 1 000. Of respondents from the group of HIV-affected households, 90.9% earned a monthly income of less than Kshs 1 000. Overall, this reflects low income in both the affected and non-affected households, even though the monthly income in the non-HIV-affected households was higher. Income affects a family's purchasing power and access to food; thus, households with less income may not be able to purchase food that will satisfy the needs of all family members.

Among the non-HIV-affected households, 80.5% of the respondents had land, while 61% in the group of HIV-affected households had land. Some of the crops grown included roots/tubers, pulses/legumes, and fruits/vegetables. Of the non-HIV-affected households, 64.9% kept livestock, and 61% of the respondents from HIV-affected households kept livestock. More than 70% of the households in both groups owned less than two acres of land. Relatively few households (20%) owned above three acres of land. Food security depends on an adequate income and assets (including land and other productive resources) as well as food available for purchase. According to the respondents in the study, limited land in the area is mainly due to reclamation of the land by Lake Victoria.

Diversity of food nutrients in relation to HIV/AIDS status

A food-frequency checklist was used as an indicator of food security; the number of food items consumed in a household provided a measure of the quality of diet. The percentages were calculated to access the diversity of both micronutrients and macronutrients in the household diet. An increase in the average number of different foods consumed provides a quantifiable measure of improved household food security (Swindale, 2005). The foods were classified into the following groups: carbohydrate sources, protein sources, vegetable/fruit sources, fats/oils sources and beverages sources.

Data in Table 2 shows that only 3.6% of the non-HIV-affected households had varied sources of carbohydrates daily, while 42.7% did not have varied sources at all. Regarding protein sources, 8.2% had varied diets daily, 4.1% weekly, 44% occasionally, and 43.5% did not have varied sources of proteins. Concerning vegetable sources, 40.5% took in varied sources only occasionally, and 44.5% did not take in any varied diet of vegetables. For the fats/oils sources, 21% took varied sources daily, 10.2% weekly, 1.5% occasionally, and 36.6% did not have varied sources. For the beverages, 30% took in varied sources only occasionally and 50.8% did not take in different types of beverages.

Among the HIV-affected households 10.7% had varied sources of carbohydrates daily, 27% only occasionally, and 48.7% did not have any varied sources. For protein sources, only 4.8% had varied sources daily, 28.8% occasionally, and 50.7% did not have varied sources. For the vegetables sources, 6.5% had varied sources of vegetables daily, 5.8% weekly, 32% occasionally, and 53.1% did not have varied vegetable sources. For the fats/oils sources, 17.2% had varied sources daily, 14.5% weekly, 13.4% occasionally, and

Table 2: Frequency of food groups taken in by the households in relation to the households' HIV/AIDS status (n = 154 caregivers of index households)

	Frequency			
Food groups taken in	Daily	Weekly	Occasionally	Never
Carbohydrate sources				
HIV-affected	89 (10.7%)	55 (6.6%)	224 (27%)	403 (48.7%)
Non-affected	30 (3.6%)	53 (7.6%)	305 (36.6%)	354 (42.5%)
Protein sources				
HIV-affected	48 (4.8%)	49 (4.9%)	287 (28.8%)	505 (50.7%)
Non-affected	82 (8.2%)	41 (4.1%)	438 (44%)	433 (43.5%)
Vegetable sources				
HIV-affected	108 (6.5%)	96 (5.8%)	532 (32%)	882 (53.1%)
Non-affected	149 (9%)	87 (5.2%)	673 (40.5%)	738 (44.8%)
Fats/oils sources				
HIV-affected	32 (17.2%)	27 (14.5%)	25 (13.4%)	70 (37.6%)
Non-affected	39 (21%)	19 (10.2%)	50 (21.5%)	68 (36.6%)
Beverage sources				
HIV-affected	30 (7.2%)	12 (2.9%)	67 (16.1%)	216 (52%)
Non-affected	35 (8.4%)	46 (11.1%)	124 (30%)	211 (50.8%)

37.6 did not have varied sources. For the beverages, 7.2% had varied sources daily, 2.9% weekly, 16.1% occasionally, and 52% did not have varied beverage sources (Table 2).

The non-HIV-affected households consumed higher in most of the food groups than was consumed by the HIV-affected group of households, except for carbohydrate sources (3.6% versus 10.7% daily, respectively).

Mean nutrient intake in the households

The kinds of nutrients consumed were ascertained by use of a 24-hour dietary recall survey. This was to facilitate the establishment of the adequacy of the household diet. A total of 40 households were randomly selected and the 24-hour dietary recall questionnaire was administered to the respondent to outline the household's food consumption patterns. Based on the recommended dietary allowance (RDA), the nutrient consumption for the non-HIV-affected group of households included kilocalories (53.2%), proteins (164.7%), calcium (105.1%), iron (182.1%), vitamin A (74.1%), vitamin B_1 (230%), niacin (126.8%) and vitamin C (223.7%). For the HIV-affected households, the nutrient intake was kilocalories (43.8%), proteins (117.9%), calcium (49.1%), iron (253.7%), vitamin A (30.3%), vitamin B_1 (106.9%), niacin (76.8%) and vitamin C (212.7%) (Table 3). The percentages of RDA for all nutrients were higher for the non-HIV-affected households compared to those for HIV-affected households, except for iron intake.

Frequency of food consumption by the households

On average, there were three meals served per day. Foods commonly served for breakfast included strong tea and porridge, *nyoyo* (maize and beans) and/or sweet potatoes. For lunch the households typically served strong tea and *ugali* with kale, porridge, *nyoyo*, *ugali* with fish, *ugali* with beef stew, or sweet potatoes. The foods served for supper were similar to those served for lunch. Information was collected using 24-hour dietary recall to check on how many meals were taken by the households. Among the group of non-HIV-affected households, 80% took three meals, 15% two meals, and 5% one meal. Of the HIV-affected group, 45% took three meals, 40% two meals, and 15% had one meal per day. More of the HIV-affected households (55%) were taking only one to two meals per day, compared to the non-HIV-affected households where majority (80%) seemed to be having three meals a day (t = 2.2; df = 38; sig. = 0.034; $p < 0.05$).

Relationship between the households' nutrient intake and HIV/AIDS status

We estimated the difference between the means of the nutrients taken in by the HIV-affected and non-HIV-affected households. The nutrients included kilocalories, proteins, iron, vitamin B_1, niacin, vitamin C, calcium and vitamin A. To show if there was a significant relationship between nutrient intake and household HIV/AIDS status, an independent sample t-test was used (see Table 4). This t-test was based on the following nutrients: kilocalories, proteins, iron, vitamin B_1, niacin, vitamin C, calcium and vitamin A. The results indicate significant differences for proteins, iron, vitamin B_1, niacin and vitamin C between the HIV-affected and non-affected households ($p < 0.05$) after adjustments were made in terms of socio-economic indicators and household characteristics. These factors were similar across the population, making the population more homogenous, hence the bias that may have appeared due to homogeneity. The group of HIV-affected households had a relatively higher intake of energy (kilocalories) and calcium, though the differences were not significant. The means for the HIV-affected sample were higher than for the non-HIV-affected sample in terms of energy intake (kilocalories [–0.441]) and calcium intake (–1.367) (Table 5). It can be envisaged that the HIV-affected households consumed more food energy sources than other food sources and this could be due to the relatively cheaper cost of cereals like maize as compared to protein sources like meat. The consumption of proteins, iron, vitamin B_1, niacin and vitamin C for the HIV-affected and non-HIV-affected households was significant in favour of the later group of households, except for iron ($p > 0.05$).

Discussion

The most commonly consumed food group was carbohydrates, especially in the HIV-affected households. The data show a pattern of consumption of carbohydrate sources for that group of households which are in line with the results of research done in Tanzania, which stated that household members consumed mainly starchy food because their low income from farming meant they could not easily purchase nutritious food. The food group consumed and the frequency of food consumption determine a household's food-security status. If the food consumption and frequency are low the household becomes more food insecure. Research in Tanzania showed that per capita food consumption decreased to 15% in the poorest households when an adult died (Barnett & Rugalema, 2000), while a study carried out in Uganda showed that food security and malnutrition were foremost among the immediate problems faced by female-headed AIDS-affected households (Committee World Food Security, 2001).

The results show a significant relationship between nutrient intake and HIV/AIDS status. The households' average nutrient intake of proteins, iron, vitamin B_1, niacin and vitamin C was higher for the non-HIV-affected group.

Table 3: Mean nutrient intake in the HIV-affected and non-HIV-affected households (*n* = 40 households in Kisumu district, Kenya, 2006)

	Frequency	
Nutrient intake (%)	HIV-affected	Non-HIV-affected
Energy (kcal)	48.3	53.2
Proteins (g)	117.9	164.7
Calcium (mg)	49.1	105.1
Iron (mg)	253.7	182.1
Vitamin A (μg)	30.3	71.4
Vitamin B_1 (mg)	106.9	230.0
Niacin (mg)	76.8	126.8
Vitamin C (mg)	212.7	223.7

Table 4: Mean nutrient intake of the households by HIV/AIDS status (*n* = 40 households in Kisumu district, Kenya, 2006)

	HIV status	Mean SD	Standard error	
			Deviation	Mean
Kilocalories	Non-HIV-affected	1.55	0.686	0.153
	Affected	1.65	0.745	0.167
Proteins	Non-HIV-affected	2.75	0.444	0.109
	Affected	2.25	0.851	0.190
Calcium	Non-HIV-affected	1.90	0.912	0.204
	Affected	2.65	2.277	0.509
Iron	Non-HIV-affected	2.55	0.826	0.185
	Affected	2.95	0.224	0.050
Vitamin A	Non-HIV-affected	1.90	0.912	0.204
	Affected	1.40	0.754	0.169
Vitamin B_1	Non-HIV-affected	3.00	0	0
	Affected	2.70	0.657	0.147
Niacin	Non-HIV-affected	2.60	0.598	0.134
	Affected	2.10	0.718	0.161
Vitamin C	Non-HIV-affected	2.70	0.657	0.147
	Affected	2.05	0.945	0.211

Table 5: Mean nutrient intake of the households: *t*-test for equality of means (*n* = 40 households)

	t for equivalence of means	df	sig
Protein	2.330	38	0.025*
Iron	2.091	38	0.043*
Vitamin B_1	0.042	38	0.048*
Niacin	2.392	38	0.022*
Vitamin C	2.527	38	0.016*
Kilocalories	–0.441	38	0.661
Calcium	–1.367	38	0.180
Vitamin A	1.890	38	0.066

*$p < 0.05$

However, the average intake of energy (kilocalories), calcium and vitamin A was higher for the HIV-affected households. However, considering that the sample size was based on outcomes from only 40 households, it is not possible to make a generalisation of this outcome; the more important results for consideration may be the variations in the means between the HIV-affected and non-HIV-affected households.

Good nutrition is important for disease resistance. The onset of AIDS illness, along with secondary diseases and death, can be delayed in individuals who have good nutritional status (Committee on World Food Security, 2001). The pattern of results for the group of HIV-affected households shows inadequate nutrient intake in people's general diet. Members of households with ailing individuals may more often face micronutrient malnutrition, which will contribute to a weakening immune status, which will further worsen clinical conditions among HIV-infected persons (Fawzi, 2004). Evidence from East Africa and southern Africa show that households affected by HIV or AIDS are usually not only eating fewer meals and consuming poorer foods, but are also investing in the health of surviving members so as to not lose even more labour (Barnett & Rugalema, 2000). In most of the households in this study, food security was an issue as they fell below the recommended number of meals, which are three in a day (Maxwell & Frankenburger, 1992).

HIV and AIDS negatively impact the nutritional health of an individual: HIV and AIDS changes the body's metabolism so that more energy, protein, and micronutrients are demanded and utilised. However, individuals with HIV or AIDS often consume less food due to loss of appetite, mouth or throat sores, pain and nausea, the side effects of medication, or as a result of worsening household poverty and livelihood insecurity. HIV and AIDS impairs the absorption of nutrients consumed on account of diarrhea and vomiting, damaged intestinal cells, and other effects of opportunistic infections. These three impacts, which often occur simultaneously, can rapidly accelerate weight loss, malnutrition, and wasting (Piwoz & Preble, 2000). A weight loss of 5–10%, particularly over less than four months (Wheeler, Gibert & Launer, 1998), is associated with an increased risk of opportunistic infections and complications (Zachariah, Spielmann, Harries & Salaniponi, 2002).

The study revealed that households affected by HIV or AIDS may spend more on healthcare and less on food. Senefeld & Polsky (2005) demonstrated that chronically ill HIV-affected households reported not cultivating as much land as they had previously, with the most commonly cited reasons being lack of fertilizer and draught power; members of such households were also more likely pass days without eating, skip meals, rely on wild foods, eat less preferred foods, and prioritise food within the household for working household members. When households increasingly modify their diets to settle for less nutritious alternatives, it is particularly dangerous for members living with HIV for whom proper nutrition is critical for a prolonged and productive life. An adequate, well-balanced diet is an essential component of basic care for PLHIV (Gillespie & Kadiyala, 2004).

Conclusions

Evidence provided in this article show that HIV/AIDS status has an impact on the generalized nutrient intake of households. PLHIV, their families, and communities are being overcome by the effects of the pandemic. Efforts to improve the frequency and quality (variety) of food and nutrient intake can be limited by low food availability, infrequent meals and a lack of easily available foods. Adequate nutrition is required in all stages of HIV disease; only healthy persons can contribute to a sufficient labour supply and national development. Diets must be diverse in terms of food groups and varied nutrient sources. It is necessary to broaden our understanding on the various nutrients and the role they play in the body especially in disease states like HIV infection and AIDS illness. Food and nutrition security are fundamentally important to the prevention, care, treatment, and mitigation of HIV and AIDS. A programme of care with a nutritional component can be introduced and a mitigation strategy that takes into account that what those affected need most is usually food, at a time when their ability to acquire food may be diminished.

Defining the intake of specific micronutrients necessary to prevent deficiencies among PLHIV is important. However, the interpretation of the currently available data is impeded by a number of methodological difficulties. The presence of micronutrient deficiencies in HIV-positive individuals cannot be attributed to the direct biological effects of HIV infection. Selection bias is a major problem in most studies; but even if micronutrient status was accurately assessed in random samples of HIV-positive and HIV-negative individuals, it would not be possible to attribute any difference in micronutrient status to HIV infection because HIV infection does not occur randomly (Friis, 2001; Tomkins, 2003; WHO, 2003). Available data suggest that HIV infection impairs the status of a range of micronutrients and that HIV-positive individuals may have increased requirements. However, because of the methodological shortcomings, the available data do not allow development of specific, evidence-based dietary guidelines. New studies are needed to determine what levels of specific micronutrients are required to prevent clinical and biochemical signs of deficiencies in PLHIV (Halliwel & Gutteridge 1990; Coutsoudis*,* 1999).

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