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RESEARCH

Dietary intake of HIV-seropositive clients attending Longisa County Hospital Comprehensive Care Clinic, Bomet County, Kenya

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Background: Dietary intake of HIV-seropositive persons remains a major concern across various settings around the globe. Inadequate dietary intake, infections and stage of disease progression elicit malnutrition among HIV-seropositive individuals, which hastens progression of HIV to full-blown AIDS.
Aim: The study sought to determine the dietary intake of HIV-seropositive clients attending Longisa County Hospital Comprehensive Care Clinic, Bomet County, Kenya.
Methods: A cross-sectional analytical study design was administered on a comprehensive sample of 210 patients. A 24-hour dietary recall questionnaire and Food Frequency Questionnaire (FFQ) were used by the researcher to collect data on the dietary intake of the respondents. The 24-hour dietary recall data were analysed using NutriSurvey whereas data obtained from the FFQ were analysed manually.
Results: Study respondents comprised more females (61.6%) than males (38.6%). Adequacy in energy intake amongst the respondents was average as males attained 47.4% of recommended energy intake, whereas females attained 50.0%. Intakes for selected nutrients, vitamin A, B_1, B_2, C, were adequate for males and females. Iron intake was significantly low among female respondents as 89.3% did not meet the RDA. Similarly, zinc intake among male respondents was low as only 28.9% met the RDA. The mean number of meals consumed by the respondents was 3.8 ± 0.1. Consumption frequency of legumes, fruits, other vegetables, meats, eggs and fish was irregular.
Conclusion: The dietary intake of the respondents was not satisfactory as evidenced by inadequacies in intake of certain nutrients and low number of meals consumed on a daily basis. Inadequate dietary intake is detrimental to HIV and AIDS management and treatment modalities, hence resulting in poor treatment outcomes. Care and treatment modalities at HIV and AIDS clinics should encompass provision of clear and concise information on the importance of adequate dietary intake as a means of optimising positive treatment outcomes.

Keywords: dietary intake, seropositive, food groups

Introduction

The World Health Organization (WHO) recommends that HIV-seropositive patients should consume adequate nutrients derived from a variety of food sources.[1] HIV-seropositive patients emanating from resource-poor settings lack access to a variety of food sources needed to provide adequate nutrients that are crucial in enhancing their nutritional status and response to anti-retroviral medications. Progression of HIV to AIDS increases the occurrence of opportunistic infections that increase an individual's nutrient requirements. This research aimed to explore dietary intake as a major variable that determines the nutritional status of HIV-seropositive persons.

Dietary intake requirements for HIV-seropositive individuals vary depending on the disease stage. As HIV progresses, the nutritional requirements increase, hence the need to increase dietary intakes. Koethe and Heimburger[2] argue that failure by HIV-seropositive persons to sufficiently meet the nutrient requirements at various HIV and AIDS stages results in HIV-associated wasting. Such wasting has been identified as a contributing factor to the occurrence of malnutrition, which is a recognised predictor of HIV progression to full-blown AIDS. Progression of HIV provides a viable platform that elicits the occurrence of opportunistic infections. Ivers *et al.*[3] note that inadequate dietary intakes results in an increase in opportunistic infections. The findings of Ivers *et al.*[3] are supported by Weiser *et al.*[4] who state that opportunistic infections that are common amongst HIV-seropositive persons impair nutrient intake and utilisation, therefore compromising nutritional status. The study was necessary because it offers crucial insights that supplement existing knowledge needed to improve nutritional status and treatment outcomes of HIV-seropositive persons.

Methods

The aim of the study was to determine the dietary intake of HIV-seropositive persons. The study followed a cross-sectional analytical design, which allowed for selection of a representative sample whose results can be generalised to other populations. The design further permitted collection of quantitative data.

The study was carried out in Longisa County Hospital situated within Bomet County in the Southern part of Rift Valley province, Kenya. The hospital's Comprehensive Care Clinic (CCC) has been operational since 2008 and it offers both adult and paediatric inpatient and outpatient services. Longisa County Hospital CCC offers daily human immunodeficiency virus (HIV) antiretroviral therapy (ART), tuberculosis (TB), and voluntary counselling and testing (VCT) services. The hospital currently serves as a referral hospital and receives referrals from lower level hospitals within Bomet County. Apart from clients drawn from Bomet County, the hospital also offers treatment and other healthcare services for those drawn from Narok and Kericho Counties.

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The study participants comprised adult (18–55 years) male and female HIV-seropositive clients active on care at Longisa County Hospital CCC. Active on care in this case means clients who are on lifelong anti-retroviral medications and who diligently follow prescribed medications and attend for review (revisit) as recommended. Longisa County Hospital CCC records indicated that 3 500 HIV-seropositive patients are enrolled at the facility of which only 1 200 are active on care and treatment. Of the 1 200, 32% (380) are adults (Longisa County Hospital Records, 2015). The records further indicated that monthly CCC attendance by adult clients averaged 210. For this reason, a comprehensive sample (100%) for a month's period was adopted as the study sample. Use of a comprehensive sample is acceptable in instances when the number of units is small,[5] which was apparent in the case of adult client CCC attendance at Longisa County Hospital. A month's attendance was appropriate because most of the clients visited the hospital within a month for review and treatment. Data were collected from HIV-seropositive adults aged 18–55 years attending Longisa County Hospital CCC at the time of study who upon informed consent were willing to participate in the study.

A 24-hour dietary recall questionnaire was used to assess nutrient intake indicated by all foods and beverages consumed by the respondents in the past 24 hours or in the previous day. The questionnaire also assessed the number of meals consumed by the respondents in a day (24 hours). The 24-hour dietary recall was conducted at clients' households whereby a structured interview with specific probes in person was administered. Foods consumed by the respondents during festive or ceremonial days were not included. The recall used was interactive as it allowed for estimation of food quantities and sizes. The participants were thoroughly probed as a means of ensuring that no foods consumed were forgotten. The time of food consumption was also recorded. The researcher visited the local market to identify local utensils used for serving foods. The utensils were calibrated before the study to help respondents approximate the quantity of food consumed at each meal. For fruits and other foods consumed raw such as sugarcane and carrots, samples were collected from the local market in order to help respondents approximate the exact size of such foods. The weight (in grams) of individual foods consumed was approximated using the South African Food Photo Manual.[6] The manual utilises photos of estimated food portions and their corresponding weight in grams. During the study, actual food sizes reported by the respondents through the 24-hour dietary recall questionnaire were equated to those in the photos and the corresponding weight in grams assigned. The gram equivalents of foods consumed by the respondents showed the nutrient adequacy. From the 24-hour dietary recall, number of meals consumed by each respondent was also recorded. The 24-hour dietary recall data were analysed using NutriSurvey (http://www.nutrisurvey.de/) software for quantity of energy, proteins, fats, vitamin A, B_1, B_2, B_6, C, iron, and zinc consumed. Intake of these nutrients was compared with the recommended dietary allowance (RDA) to establish percentage adequacy in meeting the RDA. The mentioned nutrients were of significant focus in the study due to their importance amongst HIV-seropositive persons.

A seven-day FFQ was used to collect information on the frequency of consumption of locally available foods. Two weeks prior to the research, the researcher visited two local markets (Mulot and Longisa) to identify and generate a list of locally available foods. Eleven food groups were identified and listed, which were: cereals/tubers, green leafy vegetables, other vegetables, fruits, meats, eggs, fish, legumes, milk, oil and fats, and sugars. Respondents were asked to state the number of times in a week when they consumed each of the 11 listed food groups. The 11 food groups were cereals/tubers, green leafy vegetables, other vegetables, fruits, meats, eggs, fish, legumes, milk, oil and fats, and sugars. Consumption of a given food group more than thrice in a week was considered regular consumption. Consumption of a given food group less than three times in a week was considered irregular consumption.

Statistical analysis

The 24-hour recall data analysed by NutriSurvey and FFQ data were entered in the Statistical Package for the Social Science (SPSS) software version 22 (IBM Corp, Armonk, NY, USA), which allowed for quantitative analysis using inferential and descriptive statistics. A p-value of <0.05 was used as the criterion for statistical significance.

Results

The study targeted 210 participants, but a sample of 204 was accessible. Six questionnaires were rejected, as they were incomplete; hence, the results are reported for 198 respondents (76 males and 122 females). Dietary intakes for HIV-seropositive males and females as indicated by 24-hour dietary recall were analysed differently due to variations in the RDA for each gender. Of the male respondents, 47.4% met the RDA for energy, 44.7% met the RDA for proteins, and 43.4% met the RDA for fats (Table 1). All the male respondents (100%) met the RDA for vitamin A. Regarding vitamin B_1, 60.5% of the male respondents met the RDA. Up to 75.0% of the male respondents met the RDA for vitamin B_2. A significant proportion of the male respondents (94.7%) met the RDA for vitamin B_6. Intake of vitamin C by the male respondents was high as evidenced by the fact that 71.1% of them met the RDA. Iron intake by the male respondents was adequate as 89.5% met the RDA; 71.1% of the male respondents did not meet the RDA for zinc.

Half (50.0%) of the female respondents met the RDA for energy and a significant percentage (68.0%) met the RDA for proteins. Amongst the female respondents, 53.3% met the RDA for fats, 100% met the RDA for vitamin A, and 65.6% met the RDA for vitamin B_1. In total, 86.1% of the female respondents met the RDA for vitamin B_2 and a significant proportion (89.3%) met the RDA for vitamin B_6. Intake of vitamin C by the female respondents was significant as evidence by the fact that 71.3% of them met the RDA. Iron intake by the female respondents was significantly low, as 89.3% did not meet the RDA. Zinc intake by the female respondents was 63.1% of the RDA. Table 1 provides a summary of the mean intake of energy and nutrients by the respondents in line with the RDA for HIV-seropositive clients.

The study obtained information on the number of meals consumed by the respondents from the 24-hour dietary recall, whereby focus was placed on the number of meals and snacks consumed in a day. The majority of the respondents 41.9% consumed three meals per day, 39.3% consumed four meals and snacks per day, and only 18.2% consumed five meals and snacks per day. The mean number of meals consumed by the respondents was 3.8 ± 0.1 (Table 2).

The study used a seven-day food frequency questionnaire to look into the frequency of consumption of different foods in a week. Respondents were asked to state the number of times in a week that they consumed each of the 11 listed food

Table 1: Mean energy and nutrient intake and nutrient adequacy of HIV seropositive persons

Nutrient	Mean intakes ± SD	RDI for PLWHA		% Adequacy	*p*-value
Energy (Kcal)	1935 ± 50	Male	2200	47.4	<0.001
	1926 ± 40	Female	2000	50.0	<0.059
Protein (g)	60 ± 3	Male	56	44.7	<0.185
	59 ± 2	Female	46	68.0	<0.001
Fat (g)	64 ± 4	Male	73	43.4	<0.009
	64 ± 3	Female	67	53.3	<0.174
Vitamin A (RE)	3526 ± 170	Male	600	**100***	<0.001
	3492 ± 132	Female	500	**100***	<0.001
Vitamin B_1 (mg)	1.2 ± 0.0	Male	1.2	60.5	<0.651
	1.2 ± 0.0	Female	1.1	65.6	<0.001
Vitamin B_2 (mg)	1.5 ± 0.1	Male	1.3	75.0	<0.001
	1.5 ± 0.0	Female	1.1	86.1	<0.001
Vitamin B_6 (mg)	2.9 ± 0.1	Male	1.3	94.7	<0.001
	2.9 ± 0.1	Female	1.3	89.3	<0.001
Vitamin C (mg)	125 ± 7	Male	100	71.1	<0.001
	125 ± 5	Female	100	71.3	<0.001
Iron (mg)	13 ± 0	Male	8	89.5	<0.001
	13 ± 0	Female	18	**10.7***	<0.001
Zinc (mg)	11 ± 0	Male	14	**28.9***	<0.001
	11.4 ± 0.4	Female	9.8	63.1	<0.001

Reference for RDIs: WHO (2003)[1]. Findings are based on recall from the respondents.
*Items shown in bold are the major results from the study.

groups. Consumption of a given food group more than thrice in a week was considered regular consumption. Consumption of a given food group less than thrice in a week was considered irregular consumption. As shown in Table 3, regular consumption was evident in the following food groups: oils and fats (mean score 4.6 ± 0.0), cereals/tubers (mean score 4.4 ± 0.1), sugars (mean score 4.1 ± 0.0), green leafy vegetables (mean score 3.9 ± 0.0), and milk (mean score 3.9 ± 0.1). Irregular consumption was evident in the following food groups: legumes (mean score 3.4 ± 0.1), fruits (mean score 3.1 ± 0.1), other vegetables (mean score 3.1 ± 0.1), meats (mean score 2.7 ± 0.1), eggs (mean score 2.4 ± 0.1), and fish (mean score 1.6 ± 0.1).

Discussion

HIV-seropositive clients have increased energy demands caused by HIV and its related infections.[7] Therefore, food consumption patterns assessed using a seven-day FFQ are a crucial indicator of whether HIV-seropositive clients are meeting their nutrient needs. In this study, results from the seven-day FFQ indicated that oils and fats, cereals, sugars, green leafy vegetables and milk were consumed regularly as evidenced by the fact that they were consumed more than thrice in a week. Conversely, legumes, fruits, other vegetables, meats, eggs and fish were consumed irregularly because they were consumed less than thrice weekly.

According to the WHO,[1] HIV-seropositive adults require approximately 50% to 100% more proteins than non-HIV-infected adults. Irregular consumption of legumes, meats, eggs and fish by the HIV-seropositive respondents in the current study meant that the protein needs were rarely met. As such, the respondents were more predisposed to protein energy malnutrition. The most frequently consumed source of protein was milk. While it is true that milk is a high biological value protein (animal-based protein), there is always the need to complement plant and animal proteins to enhance the nutritional status of an individual. The most probable reason for reduced consumption of proteins by the respondents is the reduced production of such foods in the study area. The commonly consumed staple food crop in the study location (Bomet County) is maize,[8] which is milled into flour and consumed as porridge. In addition, beans are grown in this area. On another note, irregular consumption of certain protein types such as fish by the respondents is a result of cultural norms, whereby fish is not considered as a food by the Kalenjin and Maasai cultures whose members are the major residents in the areas surrounding the study setting.[9,10]

Table 2: Number of meals consumed by the respondents

Number of meals	*n*	Percentage
3	83	41.9*
4	79	39.9
5	36	18.2

Mean = 3.8 ± 0.1.
*major result from this study.

Table 3: Food consumption frequency amongst the respondents

Food group	Mean	Standard error
Oil and fats	4.6	0.04
Cereals	4.4	0.05
Sugars	4.1	0.03
Green leafy vegetables	3.9	0.04
Milk	3.9	0.06
Legumes	3.4	0.07
Fruits	3.1	0.07
Other vegetables	3.1	0.06
Meat	2.7	0.06
Eggs	2.4	0.07
Fish	1.6	0.06

Data from 24-hour dietary recall provided more insights on adequacies in the nutritional intakes of the respondents. Energy intakes of the respondents did not meet the requirements as only 47.4% and 50.0% of the females met the requirements (Table 1). According to ROK,[7] HIV infection and opportunistic infections that are frequent amongst HIV-seropositive clients interfere with an individual's ability and desire to eat. As such, dietary intakes are reduced, which results in malabsorption. Energy intakes amongst the respondents could have been the result of clinical symptoms aligned with HIV and AIDS, which hinder dietary intakes amongst HIV-seropositive persons. This is in reference to notions developed by Kuria[11] and Montgomery,[12] which indicate that HIV-seropositive clients present with different clinical symptoms including anorexia, fatigue, vomiting, mouth sores, fever, diarrhoea, nausea, depression, metabolic disturbances, and anti-retroviral drug side effects. These symptoms are a significant hindrance to dietary intake. Inadequate knowledge and food insecurity amongst the HIV-seropositive persons exacerbated the situation, hence rendering the PLWHA more predisposed to malnutrition.

The 24-hour dietary recall further obtained information on the number of meals consumed by the respondents. The number of meals consumed by the males and females was not significantly different. The mean number of meals consumed by the respondents was 3.8 ± 0.1. This means that the respondents consumed three to four meals and snacks daily. As a means of addressing reduced intakes caused by HIV-related symptoms, it is recommended that HIV-seropositive clients consume small frequent meals and snacks composed of nutrient-dense foods.[13] This provides a viable opportunity that allows the HIV-seropositive persons to meet their RDA. Consumption of three to four meals and snacks by the respondents reduced the feasibility of the respondents meeting the RDA. For this purpose, there is a need to scale up nutrition education amongst HIV-seropositive clients on the importance of consuming more than three to four meals and snacks per day. However, it is of the essence to note that since most of the respondents relied on food production (farming) as a means of livelihood, consumption of more than three or four meals and snacks may not have been feasible. This is due to periods of reduced production caused by unpredictable weather conditions and emergence of crop diseases, which reduce farm yields.

Caloric/energy intake as indicated by the 24-hour dietary recall was average for both male and female respondents and this can be interpreted to mean that most of the respondents' household experienced moderate household food insecurity. The percentage adequacy of nutrient intakes for female respondents was slightly higher (insignificant) for energy, proteins, fats, and vitamins B_1, B_2, and C than that of the males. There was a significant difference in the intakes of iron and zinc between the male and female respondents. Intake of iron by the female respondents was of much concern, as it was significantly low. Percentage adequacy in meeting RDA for iron amongst women was 10.7% compared with 89.5% among males. Iron requirements for women are often high as compared with that of men. This is because of increased iron needs amongst women, especially during pregnancy.

HIV and AIDS cause reduced dietary intake, poor nutrient absorption and increased nutrient utilisation, resulting in deficiencies of various nutrients including iron.[12] Altogether, these factors severely affect the iron-nutrient status of HIV-seropositive females compared with that of males. Iron supplementation for women on care and treatment for HIV and AIDS may seem to be the most feasible means of addressing iron deficiency (anaemia). However, iron supplementation in the context of HIV and other infections may be fatal because iron promotes the replication and growth of infective disease agents.[14] For this reason, iron deficiencies amongst HIV-seropositive individuals can be best addressed by enhancing iron-nutrient intake from dietary sources.[15]

Percentage adequacy in meeting RDA for zinc amongst female respondents was significantly high (63.1%) compared with that of the male respondents (28.9%). This is of concern because males have increased zinc requirements compared with females. Zinc plays a vital role in enhancing the production of the male hormone testosterone. In addition, zinc plays other crucial roles including cell division, production of proteins and enhancing the functioning of the immune system.[16] Low intakes of zinc by the male respondents means that they were more predisposed to zinc deficiency, which is characterised by impaired immune function and loss of appetite. These symptoms can be fatal for male HIV-seropositive persons because loss of appetitive leads to under-nutrition and impaired immune function can increase their susceptibility to opportunistic infections such as tuberculosis, which can cause death.[16] Finally, zinc deficiency amongst HIV-seropositive persons can worsen the severity of HIV infection.

Conclusions

Almost half of male and female respondents did not meet the minimum caloric/energy requirements. A small proportion of the respondents managed to consume five meals and snacks per day. A majority of the respondents consumed three to four meals per day, which did not meet the dietary recommendation that HIV-seropositive clients should consume small, frequent, nutrient-dense meals as a means of addressing reduced intakes elicited by clinical symptoms of the disease. Dietary inadequacy impedes efforts geared towards maintaining adequate nutritional and overall health of HIV-seropositive persons.

Ethics approval and consent to participate

Ethical clearance and approval was obtained from Kenyatta University Ethical Review Committee Reference Number: KU/R/COMM/51/751, dated June 20, 2016. A research permit was further obtained from the National Council of Science, Technology and Innovation (NACOSTI). Respondents gave written consent before the questionnaire was administered. Participants received full disclosure on the nature and benefit of the study. Respondents unwilling to continue with the study were allowed to withdraw from the study.

Availability of data and materials

The datasets used and/or analysed during the current study are included in this published article and its supplementary information files.

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Authors' contributions – KT analysed and interpreted dietary intake from both 24-hour dietary recall and the food frequency questionnaire. EN and AO reviewed the analysed and interpreted data and provided further interpretation of the data in line with the reviewed literature. Both EN and AO made equal contribution to the publication. All the authors made significant contributions in writing the manuscript. All authors read and approved the final manuscript.

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