

SESSION 2 LINK BETWEEN NUTRITION AND HIV/AIDS

Purpose

The purpose of this session is to provide students with basic concepts of the relationship among food, nutrition, and HIV/AIDS; general dietary needs; and practices to reduce morbidity, mortality, and the progression of HIV to AIDS.

Learning objectives

By the end of the session, students will be able to:

- Explain the relationship between nutrition and HIV/AIDS
- Outline the synergism between macronutrients and micronutrients and HIV/AIDS from evidence-based studies
- Describe the benefits of adequate nutrition for people living with HIV/AIDS

Prerequisite knowledge

- Basic knowledge of the principles of nutrition throughout the life cycle
- Basic knowledge of HIV/AIDS in Africa (see Session 1)

Estimated time: 60 minutes

Outline

Content	Methodology	Timing
1. Task 1 (in Exercise 2)	Ask students to carry out the plenary task 1 in Exercise 2	15 minutes
2. Cycle of malnutrition and HIV/AIDS (RCQHC/FANTA model)		45 minutes
3. Independent and synergistic effects of malnutrition and HIV on the immune system (including the synergism between malnutrition and HIV and the effects of the synergism on productivity)	Facilitate an interactive lecture using PowerPoint 2 and Lecture Notes 2	
4. Mutual contribution of nutrition and HIV/AIDS <ul style="list-style-type: none"> • Causes of decreased food intake, absorption, and utilization • Changes in metabolism • HIV-associated wasting syndrome • Studies showing the relationship between nutrition and HIV/AIDS 		
Summary of students' presentations on Exercise 2	Divide the class into smaller groups and allow them time to carry out Task 2 in Exercise 2 . Capture discussion points on a flipchart or board	30 minutes

Required materials

- LCD or overhead projector
- Flipchart paper or board
- Writing pens

Recommended preparation

1. Be familiar with **Lecture Notes 2** (The Link Between Nutrition and HIV/AIDS).
2. Review **Discussion Points 2** to identify relevant questions to help students master the concepts. Facilitate a group discussion if time allows.
3. Decide on the timing of each activity, considering the students' backgrounds and the coverage of the content elsewhere.
4. Search for recent studies on the influence of nutritional interventions on reduced mortality and morbidity rates and prolonged life and functional capacity among people living with HIV/AIDS.
5. Review additional reading materials if needed, particularly Piwoz and Preble 2000.

Materials provided

PowerPoint Presentations

- **PowerPoint 2/overhead presentation: The Link between Nutrition and HIV**

Handouts

1. Piwoz, EG, and EA Preble. 2000. HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in sub-Saharan Africa. Washington: SARA Project, Academy for Educational Development, pp. 8-26 (or give for reference reading)
2. Hellerstein, M, and D Kotler. 1998. HIV-associated wasting syndrome and body-habitus changes. *PRN Notebook* 3(3): 14-21

Suggested reading materials

Lwanga, D, E Piwoz, and BD Giyose. 2001. Nutrition brief: Nutrition and HIV in East, Central and Southern Africa. Kampala, Uganda: Commonwealth Regional Health Community Secretariat and Washington, DC: SARA Project/AED.

Hellerstein, M, and D Kotler. 1998. HIV-associated wasting syndrome and body-habitus changes. *PRN Notebook* 3(3): 14-21.

Keithley, JK, B Swanson, M Murphy, and DF Levin. 2000. HIV/AIDS and nutrition. Implications for disease management. *Nurs Case Manag* 5(2): 52-9.

Piwoz, EG, and EA Preble. 2000. HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in sub-Saharan Africa. Washington: SARA Project, Academy for Educational Development.

Tang, AM, and E Smit. 1998. Selected vitamins in HIV infection: A review. *AIDS Patient Care STDS* 12(4): 263-73.

LECTURE NOTES 2: LINK BETWEEN NUTRITION AND HIV/AIDS

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Introduction (slide 2)

Much of this session is derived from the work of Piwoz and Preble (2000). Nutritional status may affect the progression of HIV disease in adults and the survival of HIV-infected people. The relationship between malnutrition and AIDS is well recognized, especially in Africa, where the disease was initially known as “slim disease” because of the classic wasting syndrome typically experienced by people with HIV infection.

Purpose (slides 3, 4)

The purpose of this session is to provide students with basic knowledge about the link between HIV/AIDS and nutrition the general dietary needs and practices to reduce morbidity and mortality and the progression of HIV to AIDS. The session:

- Reviews the relationship between HIV and nutrition
- Describes how HIV/AIDS affects nutrition
- Describes how nutrition affects HIV/AIDS
- Discusses the effects of macronutrients, micronutrients, and nutritional status on HIV/AIDS, as established by observational and clinical studies, to serve as guidelines for dietary needs in HIV/AIDS disease

Importance of nutrition in managing HIV/AIDS acknowledged locally

The importance of nutrition in the context of HIV/AIDS is gaining more recognition in various sectors, including the policy level. The November 2002 meeting of the East, Central, and Southern Africa (ECSA) ministers of health in Entebbe, Uganda, called for member states to mobilize communities for proper nutrition in the management of AIDS. A number of countries in the region are developing or implementing national guidelines on nutritional care and support for people living with HIV/AIDS. Tertiary institutions, especially those with nutrition courses, have a key role to play in

disseminating information on the benefits of proper nutrition to people who can pass it on to communities.

The cycle of malnutrition and HIV (slide 5)

As covered in Session 1, HIV infection is characterized by progressive destruction of the immune system, leading to recurrent opportunistic infections and malignancies, progressive debilitation, and death. Malnutrition is one of the major complications of HIV infection and a significant factor in advanced disease. In resource-constrained settings HIV infection combined with pre-existing malnutrition places a tremendous burden on people's ability to remain healthy and economically productive.

Malnutrition and HIV: A vicious cycle (slide 5)

Malnutrition and HIV negatively affect each other. HIV infection may result in poor nutrition as a result of insufficient dietary intake, malabsorption, and altered metabolism. This cycle has the following results:

- Weight loss, the most common and often disturbing symptom of HIV, reported in 95 percent to 100 percent of all patients with advanced disease
- Loss of muscle tissue and body fat
- Vitamin and mineral deficiencies
- Reduced immune function and competence
- Increased susceptibility to secondary infections
- Increased nutritional needs because of reduced food intake and increased loss of nutrients leading to rapid HIV disease progression

Synergistic effects of malnutrition and HIV

Malnutrition and HIV affect the body in similar ways. Both conditions affect the capacity of the immune system to fight infection and keep the body healthy. Before

AIDS, the impairment of immune function caused by malnutrition was called nutritionally acquired immune deficiency syndrome, or NAIDS.

As shown in slide 6, the following changes in the immune function resulting from malnutrition are similar to those caused by HIV and AIDS:

- CD4 T-lymphocyte number
- CD8 T-lymphocyte number
- Delayed cutaneous hypersensitivity
- CD4/CD8 ratio
- Serologic response after immunizations
- Bacteria killing

Effects of HIV/AIDS on nutrition (slide 7)

HIV affects nutrition in three sometimes overlapping ways:

- It is associated with symptoms that cause a reduction in the amount of food consumed
- It interferes with the digestion and absorption of nutrients consumed
- It changes metabolism, or the way the body transports, uses, stores, and excretes many of the nutrients

Decreased food consumption (slide 8)

HIV/AIDS is associated with conditions that result in reduced food intake. Decreased food consumption may result from the following factors:

- Inability to eat or swallow because of painful sores in the mouth and throat

- Loss of appetite as a result of fatigue, depression, and other changes in the mental state
- Side effects of medications, including nausea, loss of appetite, a metallic taste in the mouth, diarrhea, vomiting, and abdominal cramps
- Reduced quantity and quality of food in the household as a result of the inability to work or reduced income because of HIV-related illness

Nutrient and food absorption (slide 9)

HIV infection also interferes with the body's ability to absorb nutrients, an effect that occurs with many infections. Poor absorption of fats and carbohydrates can occur at any stage of HIV infection in both adults and children and results in excess nutrient loss. Poor absorption is caused by the following:

- HIV infection of the intestinal cells, which may damage the gut, even in people with no other symptoms of infection
- Increased incidence of opportunistic infections such as diarrhea, which is a common cause of weight loss in people living with HIV

Poor absorption of fat reduces the absorption and use of fat-soluble vitamins such as vitamins A and E. This can further compromise nutrition and immune status.

Changes in metabolism (slide 10)

Changes in metabolism in HIV-infected people occur as a result of the immune system's response to HIV infection. When the body mounts its acute phase response to infection, it releases pro-oxidant cytokines and other oxygen-reactive species. These cytokines produce several results, including anorexia (causing lower intake of food) and fever (increasing energy requirements).

If the infection is prolonged, muscle wasting occurs because muscle tissue is broken down to provide the amino acids with the immune protein and enzymes they need. These processes increase energy requirements of people living with HIV/AIDS during the asymptomatic phase by 10 percent over the level of energy intake recommended

for healthy, non-HIV-infected people of the same age, sex, and physical activity level. They increase energy requirements during the symptomatic phase by 20 percent-30 percent over the level of energy intake recommended for healthy, non-HIV-infected people of the same age, sex, and physical activity level (Seumo-Fosso and Cogill 2003).

The body also responds to this release of pro-oxidant cytokines by increasing the demand for antioxidant vitamins and minerals, such as vitamins E and C, beta-carotene, zinc, and selenium. These vitamins and minerals are used to form antioxidant enzymes.

Oxidative stress occurs in an imbalance between the pro-oxidants and antioxidants, when there are not enough antioxidants to meet the demands of the pro-oxidant cytokines. This stress is believed to increase HIV replication and transcription, leading to higher viral loads and disease progression. For this reason, many studies have examined the impact of antioxidant vitamin supplementation on HIV transmission and disease progression.

HIV/AIDS-associated wasting syndrome (slides 11, 12)

Wasting syndrome is a multifaceted complication of HIV that is well known to increase morbidity and mortality. Both body weight and body cell mass assays should be used to assess body composition to understand the clinical significance and magnitude of the wasting syndrome in HIV. Body cell mass is the metabolically active tissue compartment in the body.

Body cell mass measures are superior to body weight measures in the presence of HIV because they correlate better with mortality. Studies have found the following relationship between body cell mass changes and the progression of HIV disease:

- A progressive depletion of body cell mass in the late stages of HIV disease (Kotler 1985)
- Significant prolonged survival in patients with body cell mass of > 30 percent of body weight or serum albumin levels exceeding 3.0g/dl (Suttman 1991)

- There may be many causes of AIDS-wasting syndrome. The etiology should define the management of the condition. The following factors may be associated with the syndrome:
- Reduced energy intake
- Gastrointestinal disorders including diarrhea and malabsorption
- Metabolic parameters

Changes in body composition (slide 13)

When a healthy person suffers an acute illness that reduces food intake, inadequate levels of nutrients are ingested and absorbed by the body to meet increased energy needs. As a result, weight (fat mass) may be lost first but is usually regained immediately after normal eating habits return. Fats stored in adipose tissues are catabolized to fuel the body energy needs, thus sparing amino acids needed to build or preserve lean body mass.

With HIV/AIDS, however, the opposite seems to occur. Amino acids are more readily used to fuel energy needs, while fat continues to accrue. The patient may consume adequate nutrient levels but utilizes and stores them inadequately. The patient has excess adipose tissue in proportion to lean tissue as the body converts the digested nutrients into fat instead of lean tissue. With high triglyceride levels in the blood, resting energy expenditure is increased. The underlying causes of an HIV-infected person's inability to preserve or regain lean tissue remain unknown.

Effect of nutrition on HIV/AIDS: Observational studies (slide 14)

Effective and inexpensive ways to deal with the cycle of infection and poor nutrition include good nutrition, hygiene, and food safety. Early studies, which observed associations over time without providing specific nutrition interventions, showed that nutritional status and HIV were interrelated. These studies reported that weight loss was associated with HIV infection, disease progression, and shorter survival time.

Low blood levels of several nutrients, including, selenium, iron, zinc, and vitamins A, B₁₂, and E, were associated with faster HIV disease progression and reduced survival. This was found after taking into account patients' use of antiretroviral drugs, immune status, and diet. However, these data on the impact of nutrition interventions on HIV have various limitations:

- These observations alone do not show whether the nutritional deficiencies caused or resulted from HIV progression.
- Most studies were conducted in the United States or with European populations with access to antiretroviral drugs and multivitamins and without endemic malnutrition.
- Controlled clinical trials are needed to find out whether improving nutrition can affect HIV progression and prolong patient survival.

Effect of nutrition on HIV/AIDS: Clinical trials (1) (slide 15)

Since the 1980s a number of controlled clinical trials have studied the effects of nutrition on HIV. Many of the trials were done with patients with AIDS, but some were done with patients at early stages of HIV infection.

These studies show that nutrition supplementation and counseling interventions may reduce HIV patients' vulnerability to weight loss and muscle wasting. This effect is confirmed particularly when nutrition supplements are given in the early stages, when low dietary intake and poor nutrient absorption are the primary causes of weight loss. Later in the course of infection, when metabolic changes begin to play a leading role in the wasting process, other types of interventions are required.

In one of the studies on HIV/AIDS and nutrition quoted in Piwoz and Preble (2000), HIV-infected adults who were given high energy/protein liquid supplements gained weight and maintained it as long as they did not suffer secondary infections. In another of the studies, AIDS patients were given fish oil supplements containing omega-3 fatty acids, which the body needs to respond to inflammation, and those patients who did not suffer from new secondary infections gained weight. In yet another, patients who had already lost a significant amount of weight and were

given counseling and a supplement containing amino acids and several antioxidant vitamins and minerals gained weight and experienced an increase in muscle mass.

Effect of nutrition on HIV/AIDS: Clinical trials (2) (slide 16)

Studies in which single or multiple micronutrient supplements were given to patients showed that these supplements improved the immune system, reduced oxidative stress, and reduced the risk of morbidity and mortality. Summaries of studies that measured the effects of different supplements are listed below.

- Studies in Tanzania and South Africa showed that vitamin A supplementation reduced diarrhea and mortality and improved several indicators of immune status in HIV-infected children. However, the exact dosage for maximum effectiveness remains unknown.
- Other studies of men from the United States have shown that improving vitamin B₁₂ status improves CD4 cell counts.
- One study with Canadian adults concluded that supplementation with vitamins E and C reduced oxidative stress and HIV viral load.
- A study in Zambia found that taking vitamin E supplements in the late stage of the disease may not be effective because the vitamin is fat soluble and poorly absorbed.

Multivitamin supplementation has also been shown to improve pregnancy-related outcomes and immune status.

Nutrition and HIV/AIDS: Clinical trials (3) (slide 17)

- In France, HIV-infected patients were given selenium and beta-carotene supplements, which increased antioxidant enzyme functions in those studied.
- A study of AIDS patients in Italy found that zinc supplements reduced the incidence of opportunistic infections, stabilized weight, and improved CD4 counts. Some studies in the United States however, suggest that additional zinc intake is associated with faster HIV-disease progression.

- Finally, a study of AIDS patients in the United States showed that treating anemia with synthetic erythropoietin slowed HIV-disease progression and increased survival time.

Nutrition and HIV/AIDS: A summary (slide 18)

- HIV affects nutrition by decreasing food consumption, impairing nutrient absorption, and causing changes in metabolism, HIV associated wasting, and body-habitus.
- Nutritional status also affects HIV disease progression and mortality.
- Improving and maintaining good nutrition may prolong health and delay HIV disease progression. The impact begins early in the course of HIV infection, even before other symptoms are observed.
- Counseling and other interventions to prevent or reverse weight loss are likely to have the greatest impact early in the course of HIV infection.
- Nutritional supplements, particularly antioxidant vitamins and minerals, may improve immune function and other HIV-related outcomes, especially in nutritionally vulnerable populations.

References

Commonwealth Regional Health Community Secretariat and the SARA Project. 2001. Nutrition brief: Nutrition and HIV in East, Central and Southern Africa. Tanzania and Washington, DC.

Hellerstein, M, and D Kotler. 1998. HIV-associated wasting syndrome and body-habitus changes. *PRN Notebook* 3(3): 14-21.

Keithley, JK, B Swanson, M Murphy, and DF Levin. 2000. HIV/AIDS and nutrition. Implications for disease management. *Nurs Case Manag* 5(2): 52-9.

Piwoz, EG, and EA Preble. 2000. HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in sub-Saharan Africa. Washington: SARA Project, Academy for Educational Development.

Seumo-Fosso, E, and B Cogill. 2003. Meeting nutritional requirements of HIV-infected persons. Washington DC: FANTA Project, Academy for Educational Development. Forthcoming.

Tang, AM, and E Smit. 1998. Selected vitamins in HIV infection: A review. *AIDS Patient Care STDS* 12(4): 263-73.

EXERCISE 2

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TASK 1: Use this exercise at the beginning of the session or when introducing the relationship between nutrition and HIV/AIDS.

Write each of the factors below on separate pieces of paper.

Effects of Nutrition on HIV/AIDS

- Further decrease in Immunity
- Healing process
- Disease progression
- Cost of treatment

Effects of HIV/AIDS on Nutrition

- Increased energy needs
- Malabsorption
- Adverse drug effects
- Frequent diarrhea episodes
- Anorexia and nausea
- Recurrent infections
- Increased nutrient requirements
- Inflammatory response
- Abnormal metabolic response

Write “HIV/AIDS” on a board or post a card on the wall. On the left write “Effects of nutrition on HIV/AIDS,” and on the right write “Effects of HIV on nutrition,” as illustrated below.

Effects of
nutrition on
HIV/AIDS

HIV/AIDS

Effects of
HIV/AIDS on
nutrition

Pass out the pieces of paper with the factors written on them, one to each student. Ask students to go to the wall and stick or tape their factors on the appropriate side of the “HIV/AIDS” card. Allow time for discussion. Then ask students to explain their choices (for example, why anorexia was placed under “Effects of HIV on nutrition” rather than under “Effects of nutrition on HIV/AIDS”).

TASK 2: Ask students to list on a flipchart or board the factors that are likely to influence the nutritional status of people living with HIV/AIDS in the country. Once the factors are listed, ask students to categorize them according to the following:

- Social factors
- Biological factors
- Programmatic factors

Allow students time for discussion. Then ask them to explain how each factor influences the nutritional outcome. Make sure the explanations are relevant to the local context.