

## The Implications of HIV/AIDS on the Nutritional Status and the MNT for Its Patients

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### Abstract

Human immunodeficiency virus (HIV) and Acquired immunodeficiency syndrome (AIDS) are severe and deadly diseases. They can cause a number of health complications including opportunistic infection, malnutrition, wasting syndrome, and oxidative stress. HIV affects nutrition in many overlapping ways. HIV/AIDS is associated with symptoms that cause a reduction in food intake and also affects digestion and absorption of nutrients. It also alters metabolism, or the way the body transports, uses, stores, and excretes many nutrients.

The nutritional problems have been shown to be significant and contribute to health and death in HIV+/AIDS patients. Weight loss, lean tissue depletion, lipodystrophy, loss of appetite, diarrhea, and the hypermetabolic state each increase risk of death. The role of nutrition and how oxidative stress is involved in the pathogenesis of HIV+ leading to AIDS is reviewed. Studies consistently show that serum antioxidant vitamins and minerals decrease while oxidative stress increases during AIDS progression. The optimization of nutritional status, intervention with foods and supplements, including nutrients and other food components, are needed to maintain the immune system. People with HIV+/AIDS can be informed about the basic concepts of optimal nutrition by identifying key foods and nutrients, along with lifestyle changes, that contribute to a strengthened immune system. Moreover, nutritional management, counseling and education should be beneficial to the quality and extension of life in AIDS.

**Keywords:** HIV; AIDS; Malnutrition; Complications; Supplementation

HIV or Human Immunodeficiency Virus was first identified in 1981 and it's estimated there were 35.3 million people living with HIV. Since the start of the epidemic around 75 million have become infected with HIV [1]. This made it the second largest epidemic of the twentieth century after influenza, which caused 20 million deaths globally. Sub-Saharan Africa remains most severely affected, with nearly 1 in every 20 adults living with HIV and accounting for 71% of the people living with HIV worldwide [2].

Significant evidence demonstrated that HIV causes AIDS. HIV belongs to a class of viruses called retroviruses. It attacks white blood cells, attaching itself to cells with the help of a specific surface protein called CD4. This impairs the functioning of the attacked cell, and as more and more cells are attacked the body's immunity is gradually weakened. The progressive destruction of the immune system is leading to recurrent opportunistic infections and malignancies, progressive debilitation, and death. Wasting is caused by malnutrition is one of the major complications of HIV infection and a significant factor in advanced disease [3].

HIV is most often transmitted during sexual activity, and dendritic cells at or near the mucosal surface of the involved sites play an important role in the initiation of HIV infection [4]. These cells bind with high affinity to the HIV envelope glycoprotein gp120 and can retain infectious particles for days, thus facilitating the presentation of the virus to susceptible cells. The replication cycle of HIV in its target cell begins with the binding of viral gp120 to the CD4 molecule, its receptor on the host-cell surface. Once gp120 binds to CD4, the glycoprotein undergoes a conformational change that facilitates its binding to a cellular co receptor. Fusion with the host cell membrane follows, and infection is established.

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HIV seems to thrive on immune activation. Indeed, chronic immune activation is a hallmark of HIV disease and results in increased viral replication and immune cell depletion, immune cell dysfunction, and aberrant lymphocyte turnover [5]. In addition to endogenous factors, such as the effects of proinflammatory cytokines, exogenous factors, including the direct interaction between the HIV envelope and various cell types and the effects of other infecting microbes, are associated with heightened cellular activation and thus may have important effects on HIV disease.

Malnutrition and HIV negatively affect each other. HIV/AIDS is considered as a significant risk to nutritional status and may result in poor nutrition as a result of inadequate dietary intake, malabsorption, and altered metabolism [6].

Wasting is considered as the most widespread and often distressing symptom of HIV, reported in 95-100 % of patients with advanced stages of the disease as a result of loss of muscle mass and body fat. In addition, inadequate intake and malabsorption can lead to vitamins and minerals deficiencies, compromised immune functions and competence and to an increased vulnerability to secondary infections [7]. HIV/AIDS patients may also have increased nutritional needs because of reduced food intake and increased loss of nutrients leading to rapid HIV disease progression. Malnutrition and HIV affect the body in very similar ways. Both conditions undermined the functions of the immune system in fighting infections and keeping the body healthy [8].

### Effects of HIV/AIDS on nutritional status

HIV-infected patients may be at nutritional risk at any point in their illness [9]. Severe malnutrition and weight loss, particularly loss of lean tissue, and delayed weight gain and height velocity in children, can affect morbidity and mortality. Development of hyperglycemia and lipid abnormalities may increase the risk of diabetes, heart disease, and stroke [10].

Decreased food intake maybe a result of the following factors:

1. Difficulties in chewing or swallowing due to painful mouth and throat sores loss of appetite as a result of fatigue, depression, and other changes in the mental state
2. Side effects of medications, including nausea, loss of appetite, a metallic taste in the mouth, diarrhea, vomiting, and abdominal cramps. HIV infection also interferes with the body's ability to absorb nutrients such as fats and carbohydrates can occur at any stage of HIV infection and results in excess nutrient loss. Poor absorption is caused by the following:
3. HIV infection of the intestinal cells, which may damage the digestive system, even in people with no other symptoms of infection.
4. Increased incidence of opportunistic infections which lead to diarrhea the cause of weight loss in HIV patients.

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

Anorexia and oral/gastrointestinal symptoms such as pain, nausea, vomiting, malabsorption, and diarrhea may arise from HIV infection, secondary infections, encephalopathy, or drug therapies. Inability to eat food secondary to complicated medical regimens or fatigue adds to the nutritional risk [11]. Opportunistic infections are associated with increased resting energy expenditure, and HAART may be associated with increased [12] or decreased resting energy expenditure. Clinically, these symptoms may prevent adequate nutritional intake [13], resulting in continued weight and lean tissue loss, vitamin or mineral deficiencies, and poor nutritional status [14].

Wasting syndrome is a multifaceted complication of HIV/AIDS 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/AIDS [15].

The following factors may be associated with the syndrome:

- a. Reduced energy intake
- b. Gastrointestinal disorders including diarrhea and malabsorption
- c. Metabolic parameters

### Changes in body composition

Amino acids are more readily used to fuel energy needs, while fat continues to build up. 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 [16].

### MNT for HIV/AIDS Patients

Effective and inexpensive ways to deal with the cycle of infection and poor nutrition include good nutrition, hygiene, and food safety. Several studies 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 [17].

These studies showed that nutrients supplementation reduced 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 [18].

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 [19].

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 [20].

HIV-infected patients were given selenium and beta-carotene supplements, which increased antioxidant enzyme functions in those studied [21].

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.

Recommendations for nutritional care vary depending on the underlying nutritional status of the person and the extent of HIV disease progression. Nutrition recommendations should consider disease stage and body composition [22].

Nutrition priorities vary according to individual symptoms and energy and nutrient needs, which depend on the stage of disease [23].

During the early phase the main objective is to stay healthy by building stores of essential nutrients, maintaining weight, preserving lean body mass, and understanding and following food safety guidelines through proper nutrition education and counseling.

During the middle phase a patient who has or has had an acute infection accompanied by weight loss should primarily minimize consequences by maintaining food intake during an infection and increasing energy nutrient intake and meeting requirements for proteins, iron, and vitamins A, B, C, and E for recovery and weight gain. Physical activity is also important in preserving lean body mass.

As the disease progresses to AIDS in the late phase, the main objective is to provide comfort or palliative care. This care includes treating opportunistic infections, modifying the diet according to symptoms, and encouraging eating. Psychological and emotional support is also important priorities at all stages of the disease [24].

**Prevention of weight loss:** This includes promoting adequate calorie and protein intake (e.g., creating an individualized meal plan based on the patient's food security and needs) and advising on lifestyle changes to avoid practices that negatively influence food intake, nutrient use, disease condition, and recovery.

**Body composition improvement:** Include promoting regular exercise to preserve muscle mass and at times using steroids and other growth stimulants to preserve or increase body cell mass.

**Immunity improvement and infections prevention:** Include promoting increased micronutrient (vitamin and mineral) intake, encouraging the observation of food safety and handling practices to prevent food borne illnesses, and promoting the use of ARVs to reduce viral load where necessary and possible.

Recommendations should be guided by the condition of the patient's disease state and body composition [25].

### Nutrients requirements for HIV/AIDS patients

**Energy requirements:** HIV-infected *asymptomatic* people should increase energy intake 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. HIV-infected symptomatic people should increase energy intake by 20-30 percent over the level of energy intake recommended for healthy, non-HIV-infected people of the same age, sex, and physical activity level. The recommendation during the *symptomatic* phase is a range from 20 to 30 percent because energy needs increase as the disease progresses and opportunistic infections worsen [26].

**Protein requirements:** HIV-infected asymptomatic and symptomatic people do not require additional protein beyond the intake level recommended for healthy non infected people of the same age, sex, and physical activity level. Although the onset of opportunistic infections leads to nitrogen losses, studies have not demonstrated that increased protein intake by HIV-infected people improves clinical outcomes [27].

**Vitamin and minerals:** The other option is the use of nutrient supplements, particularly antioxidant vitamins and minerals. Supplements can improve immune function and other HIV-related outcomes, especially in nutritionally vulnerable populations. Multivitamin and multimineral supplements are better than single vitamin or mineral supplements because they ensure meeting the varied nutrition requirements. HIV causes changes in the cells and intestines, and many minerals and vitamins are not absorbed as well as they used to be [28].

Deficiencies of total calories, protein, vitamin A, vitamin B6, vitamin B12, vitamin C, vitamin E, magnesium, iron, selenium, and zinc are associated with HIV. Normalization of these vitamin and mineral deficiencies may be linked to slower disease progression, though the evidence is not conclusive. Though micronutrient needs for people living with HIV/AIDS are largely unknown, the recommendation is not to exceed two times the recommended daily allowance (RDA). The following levels of intake have been recommended. This information needs to be updated regularly as research findings are obtained.

- a. Vitamin A: 13,000-20,000 IU or 2-4 times the RDA (Vitamin A RDA = 5,000 IU)
- b. Vitamin E: 400-800 IU
- c. Vitamin B: High-potency vitamin B complex, e.g., B25 or B50 with niacin and B6
- d. Vitamin C: 1,500-2,000 mg
- e. Selenium: 200 mcg
- f. Zinc: 1 RDA (12-19 mg)

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People with HIV should be informed that nutrient supplementation is only useful in combination with an adequate and well-balanced diet and can never replace the need for proper food intake. A multi-micronutrient nutritional supplement covering recommended daily allowance will help people with HIV maintain their nutritional status [29].

Caution must be exercised when prescribing supplements to HIV-infected patients.

Often patients take in too much, causing adverse effects such as diarrhea, nausea, and stimulation of viral replication (zinc, iron, and vitamins E and C) that hamper food consumption, absorption, or utilization. Special care must be taken when giving supplements, especially during pregnancy and breastfeeding. Excessive amounts of certain nutrients (including vitamin A, vitamin E, zinc, and iron) impair rather than improve the immune system and can cause harm to mother and infant.

Good nutrition can help prevent weight loss and strengthen the immune system.

Some foods, however, should be avoided because they aggravate the commonly occurring symptoms discussed previously. These foods may speed up disease progression through infections or have so little nutritional value that they do not help improve nutritional status [30]. The following foods and habits should be avoided:

1. Raw eggs, unpasteurized milk, and dairy products from unpasteurized milk may contain bacteria, particularly *Salmonella* that are harmful to the already weakened immune system of the HIV-infected person.
2. Undercooked meats and chicken may contain bacteria that are harmful to the already immune-compromised HIV-infected person.
3. “Junk” foods and snacks such as chips, biscuits, and sweets have little nutritional value, and sweets and sugar may promote the growth of fungi.
4. Alcohol and coffee decrease appetite and interfere with metabolism. Alcohol may interact with some medications, decreasing their efficacy.
5. Smoking increases the amount of free radicals in the body.
6. Expired foods, acidic foods, foods with preservatives, and oily foods aggravate symptoms related to diarrhea, nausea or vomiting, loss of appetite, and mouth and throat sores.

Muscle loss often occurs when disease or trauma places additional nutritional demands on HIV patients who commonly eat less because of a diminished appetite.

This causes the body to use protein from muscle stores to fight the disease. Over time the muscles become weaker and smaller and less flexible. Eventually muscle loss makes it difficult to recover from illness, impairs mobility, and affects quality of life. Muscle and lean body mass can be preserved through regular exercise or the use of steroids or hormones [31].

Increased nutrient and mineral intake is essential to replenish body stores as HIV infection increases nutrient needs. Food-based approaches are recommended as a first line of intervention because they are safer, have no undesirable side effects, and in most cases are affordable. Such strategies include recommending vitamin- or mineral-enriched products such as fortified breakfast cereals, beverages, and maize, millet, rice, or wheat flour. This fortification can also be done at home using “micronutrient sprinkles” [32].

### Conclusion

Nutritional care should be part of a comprehensive HIV/AIDS program, which requires considering a broad range of factors to design and implement nutritional care and support interventions.

Nutritional care and support for people living with HIV/AIDS is part of the utilization component of food security. It enables people living with HIV/AIDS to obtain the energy and nutrients to meet their nutritional needs, manage symptoms, prevent weight loss, maintain optimal nutritional status, and support immune function. This requires a combination of appropriate dietary behaviors, hygiene and symptom management, availability of and access to food, and knowledge about nutritional needs.

HIV, ensuing opportunistic infections, and medications can all increase the body's nutritional needs, inhibit nutrient absorption, or reduce food intake.

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