THE ROLE OF NUTRITION IN THE CLINICAL MANAGEMENT OF HIV INFECTION/AIDS

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Malnutrition, wasting and chronic diarrhoea are common in patients with human immunodeficiency virus (HIV) infection (Keusch and Thea 1993; Kotler 1994; Ekelund and Lindberg 1997; Hickey 1991). In the early 1980's in Africa, the acquired immunodeficiency syndrome (AIDS) was commonly referred to as the "slim disease" because of the characteristic wasting associated with the disease. Possible causes of weight loss in these patients include decreased food intake due to oral pathology (taste changes, painful mouth and/or throat, chewing and/or swallowing difficulties), anorexia, nutrient malabsorption and systemic infections. The exact reason for the weight loss is the specific complication developed by the individual. When a secondary infection is superimposed on HIV, patients experience hyper-metabolism characterized by altered fat and protein metabolism. (Bell et al, 1993).

Protein energy malnutrition (PEM), commonly seen in HIV infection, can result in a worsening of cellular immunity and a reduction in functional ability (Hoyt and Staats, 1991). Because nutritional needs of HIV patients vary greatly, individual strategies have to be designed as the patient moves through the stages of disease. The role of nutrition in the clinical management of HIV infection is two fold. The first is to prevent loss of certain nutrients which are associated with the immune system of the body. The second is to prevent loss of lean body mass (LBM) which is associated with increased mortality in patients with AIDS (Kotler, 1994).

Preventing and Treating Protein Energy Malnutrition

PEM results when absorbed calories and protein do not meet the patient's metabolic needs. It also can be due to inadequate intake or diarrhoea. To prevent PEM, patient's food intake should be monitored and problems that might limit intake identified. It is advisable to weigh patients regularly and monitor losses carefully. Serum albumin is a good indicator of protein status when patients are not acutely ill.

For most patients, the goal is to eat more if they are losing weight. Attempts should be made to increase the caloric content of the diet before adding supplements. The basic rule is to get all nutrients from foods. If the patient has active secondary infections, then it may be necessary to administer artificial diets by tube or by vein.

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The following guideline is useful in calculating protein and caloric needs in patients receiving nutrition support (enteral or parenteral):

- For weight maintenance, use 35-45 Kcal/kg actual body weight
- Add 500 Kcals/day to foster 0.45 kg/week weight gain
- Intake of 1.2 to 2g protein/kg weight is necessary to promote anabolism.

Table 1 lists components of nutrition assessment and possible causes of malnutrition and Table 2 provides reference values for anthropometric assessments.

Table 1: Nutrition Assessment of People with HIV

COMPONENT	WHAT TO LOOK FOR
General appearance	Cachexia; truncal and bitemporal muscle wasting
Weight history	> 10% below usual weight Recent loss of > 4.5 kg
Visceral protein stores Serum albumin Prealbumin Retinol-binding protein	 > 3.0 g/dL > 16 mg > 3.9 mg/dL
Fat and somatic protein stores Mid-arm circumference	> 25th percentile
Physical problems associated with eating	Nausea, vomiting, diarrhea, dysphagia, dynophagia, dysgeusia, difficulty chewing, shortness of breath
Diet history	Inadequate intake
Vitamin/mineral usage	Possible megadosing, nutrient imbalances
Alternative nutrition therapies	Potential deficiencies with dietary therapies, toxicities of herbs
Food intolerance	Dairy, citrus, spicy foods
Social considerations	Inadequate funds for food, kitchen facilities Shopping/cooking problems

Adapted from: Rakower D, Galvin TA. Nourishing the HIV-infected adult. *Holist Nursing Pract. 1989;3(4):29.*

Table 2: Reference values for anthropometrical assessment

Suggestion for grading of malnutrition:

BMI (KG/M^2)	**GRADE**
18.5-24.9	Normal
17.0-18.4	CED grade I
16.0-16.9	CED grade II
<16.0	CED grade III

Reference: Ferro-Luzzi A, Sette S, Franklin M et al. A simplified approach of assessing adult chronic energy deficiency. Eur J Clin Nutr 1992; 46:173-86.

Assessment of Triceps skinfold (TSF) and Arm Muscle Circumference (AMC):

	Gender	Reference value	Low value
TSF (mm)	F	21	≤ 11
TSF (mm)	M	11	≤ 5
AMC (cm)	F	22	≤ 18
AMC (cm)	M	26	≤ 22

Reference: Symreng. Arrm Anthropometry in Large reference population and in Surgical patients. Clinical Nutrition 1992;1:211-19.

Assessment of weigh loss in per cent:

Period of time	Normal	Moderate	Severe
One month	0	2-4	5
Three months	0	5-6	7
Six months	0	8-9	10

Reference: Mossberg T. Klinisk nutrition och vå tskebehandling.8:e uppl. Wasa: Graforama, 1995.

References for Body Fat in per cent:

Age group (years)	Male (% of body weight)	Female (% of body weight)
20-29	15	29
30-39	23	33
40-49	25	35
50-68	-	39
50-72	28	-

Reference: Durnin J V G A, Womersley J. Br J Nutr 1974;32:77-97.

Most patients with HIV infection have increased metabolic needs even when they have no secondary infection. With secondary infection resting energy expenditure (REE) increases by up to 35% and food intake is adversely affected. Under these circumstances REE may continue to increase thus leading to further wasting.

Abnormal fat metabolism is another problem which has been reported among patients suffering from HIV infection (Decsi et al 1995; Peck et al 1993; Heijligenberg et al 1997). In these patients basal lipolytic rates are higher than in control subjects possibly due to increased secretion of cytokines. Overproduction of cytokines may result in ineffective utilization of fat stores as a source of fuel. This may lead to further loss of lean body mass.

Inadequate Food Intake

Inadequate food intake can result from many physical, psychological or social problems. Some of the problems include painful mouth and/or throat, dryness in the mouth, taste changes, chewing and/or swallowing difficulties, anorexia, nausea, vomiting, fever, infections, feebleness and depression (Ekelund and Lindberg, 1997). Table 3 lists factors that may hinder food consumption and gives practical solutions which may assist the patient in improving food intake. The solutions suggested were arrived at through discussion with 20 People Living With HIV/AIDS (PLWHA) in Dar es Salaam and in consultation with a staff from WAMATA, a local non-governmental AIDS organization (Ekelund and Lindberg, 1997). Additional information was gathered from the literature.

Table 3: Factors Hindering Food Consumption

PROBLEM	INTERVENTION
1. Anorexia (poor appetite)	Small frequent meals; calorie/protein-dense foods; relaxation techniques before meals, appetite stimulant.
2. Nausea	Cold, bland, or dry foods; eat small meals often; drink between meals rather than with meals; avoid greasy and spicy food.
3. Vomiting	Liquid diet (temporarily); eat when asymptomatic; antiemetics.
4. Diarrhea	Foods with high potassium content such as cassava; avoid carbonated drinks; avoid drinking alcohol. Use of bulking agents; fluid replacement; assess for malabsorption.
5. Early satiety	Small frequent meals; avoid liquids before meals, gastric motility agent.
6. Dysphagia	Soft, mashed, (difficulty swallowing) foods as tolerated; calorie/protein-dense supplements.
7. Odynophagia	Same as Intervention 6 plus: avoidance (painful swallowing) of foods that cause pain (soda bubbles, citrus, spicy and rough foods). Treat underlying cause.
8. Difficult/painful chewing	Same as Interventions 6 & 7.
9. Dysgeusia (abnormal taste)	Add strong flavors to foods.
10. Shortness of breath	Nasal cannula at mealtimes.
11. Dementia	Assistance with meals, enteral feeding.
12. Dietary restrictions	Dietitian should assess individually.
13. Constipation	Eat a lot of fruits and vegetables; drink a lot of boiled water and/or fruit juices; try regular toilet habits and take your time.
14. Fever	Drink plenty of foods; if can't eat try food-based fluids.
15. Depression	Refer to psychotherapist.

Adapted from: 1) Rakower D, Galvin TA. 1989;3(4):29.
2) Ekelund A, Lindberg K. 1997.

By conducting personal interviews with PLWHA it became evident that many of their problems are related to diet and nutritional status. Thus an important role for WAMATA is to provide information on the importance of diet, safe food preparation and solutions to diet-related problems. It should be stressed that whatever nutritional advice is given it should be tailored to the individual needs of the affected person.

Many people with HIV/AIDS face a number of social problems which can contribute to poor food intake. Prime on the list is social isolation where the affected person may be thrown out of the family.

Without family support the individual may become psychologically affected and probably drawn into active drug use. All of these scenarios individually or in combination are likely to adversely affect food intake.

Diarrhoea

Diarrhoea is common in patients with HIV and is accompanied by nutrient loss. To minimize the effects of diarrhoea, nutrient and fluid intake should be ensured. If possible the underlying cause of diarrhoea should be treated. If malabsorption is suspected, the patient with diarrhoea may need referral to a specialist.

Micronutrients in the management of the AIDS patient.

In addition to macronutrient deficiency many single micronutrient deficiencies occur in patients with HIV. Available evidence shows that micronutrient deficiencies are associated with HIV-1 disease progression (Baum et al, 1995; Macallan 1999; Tang et al, 1993; Allard et al 1998) and mortality (Tang et al 1996,Baum and Shor-Posner 1998) and may also be associated with enhanced mother-to-child transmission of virus (IVACG 1997; 1999; Macallan 1999). The probable mechanisms by which micronutrient malnutrition can alter the rate of transmission of the HIV is by impaired protection against oxidative stress (Allard et al, 1998), impairment of immune function (Baum and Shor-Posner, 1998), metaplasia of epithelial tissues (Mostad et al, 1997) or increased susceptibility to infection (Anonymous, 1998). In a study involving 281 heterosexual men followed up for 8 years it was reported that the lowest and highest intake of vitamin A was associated with increased progression of the disease whereas moderate intake of 9000-20000 IU/day were associated with a reduction in its progression. A high intake of niacin (>61mg/day), vitamin E (>715mg/day) and thiamin (>5mg/day) was associated with reduced progression of HIV to AIDS. In contrast, high zinc intake was associated with an increase risk of progression to AIDS in a dose response pattern. High intakes of thiamin (>5.3mg/day), riboflavin (>6.3mh/day) and niacin (>64mg/day) were associated with improved survival.

Baum et al (1995) evaluated the relationship between plasma levels of proteins, zinc, iron, vitamins A, B_1, B_2, B_6, B_{12}, C, E and folate and CD_4 cell counts (immunological markers) among 108 HIV-1 seropositive homosexual men over an 18-month follow-up. Development of deficient states for vitamin A or vitamin B_{12} was associated with a decline in CD_4 cell count while normalization of vitamin A, vitamin B_{12} and zinc was associated with CD_4 cell counts. These findings were largely unaffected by zidovudine (antiretroviral drug) use. For vitamin B_{12} , low levels at baseline significantly predicted accelerated HIV-1 disease progression determined by CD_4 cell count.

In Malawi, Semba (1997a, 1997b) reported that serum retinol concentration among pregnant HIV-infected women was inversely related to maternal mortality as well as mortality of their infants during the first year of life. Mortality of infants of women with serum retinol concentration of <10 μg/dL was 93% compared to 14% in infants of mothers with normal serum vitamin A levels.

In a large study conducted in Tanzania, the effects of vitamin A and multivitamins on birth outcomes were assessed in HIV-1 infected women (Fawzi et al, 1998). HIV-1 infected women at between 12 and 27 weeks' gestation received placebo (n=267), vitamin A (n=269), multivitamins excluding vitamin A (n=270), multivitamins including vitamin A (n=270) in a randomized, double-blind, placebo-controlled trial with a 2x2 factorial design. The study investigated the effect of multivitamin and/or vitamin A supplementation on birth outcomes and counts of T-lymphocyte subsets. Thirty fetal deaths occurred among women assigned multivitamins compared with 49 among women given placebo. Additionally, multivitamin supplements decreased the risk of low birth weight by 44 percent, severe preterm birth by 39% and small size for gestational age at birth by 43%. Multivitamin supplements also resulted in a significant increase in CD_4, CD_8 and CD_3 counts. Vitamin A supplements had no effect on any of these parameters

Conclusion

The available evidence supports overall the important role of nutrition in the management of the patient with HIV infection starting from the early stages of the disease. Tube feedings or parenteral nutrition may be required if oral intake is insufficient. Restricted diets that severely limit food choices may impede adequate intake. Certain micronutrients play an important role in the maintenance of cell-mediated immunity as well as influencing specific clinical outcomes. Vitamin and mineral megadoses should be avoided because they can impair immunity as well as general biologic functioning.

References:

1. Keusch GT, Thea DM. Malnutrition in AIDS. *Med Clin North Am 1993 Jul; 77(4):795-814.*

2. Kotler. DP. Wasting syndrome: Nutritional support in HIV infection. *AIDS Res Hum Retroviruses 1994 Aug; 10(8):931-4.*

3. Ekelund A, Lindberg K. HIV/AIDS and Nutrition in Tanzania - a Field Study and a Design for Guidelines. Thesis. Goteborg University. 1997.

4. Hickey MS. Nutritional support of patients with AIDS. *Surg Clin North Am 1991 Jun; 71(3):645-64.*

5. Bell SJ, Mascioli EA, Forse RA, Bistrian BR. Nutrition support and the human immunodeficiency virus (HIV). *Parasitology 1993; 107 Suppl:S53-67.*

6. Hoyt MJ, Staats JA. Wasting and malnutrition in patients with HIV/AIDS. *J Assoc Nurses AIDS Care 1991; 2(3):16-28.*

7. Decsi T, Zaknun D, Zaknun J, Sperl W, Koletzko B. Long-chain polyunsaturated fatty acids in children with severe protein-energy malnutrition with and without human immunodeficiency virus - 1 infection. *Am J Clin Nutr 1995;62:1283-8.*

8. Peck MD, Mantiero-Atienza E, Muguez-Burbano MJ, Fletcher MA, Shor-Posner G,Baum MK. The esterified plasma fatty acid profile is altered in early HIV-1 infection. *Lipids 1993;28:593-7.*

9. Heijligenberg R, Romijn JA, Klein S, Endert E, Sauerwein HP. Lipolytic sensitivity to catecholamines in patients with human immunodeficiency virus infection. *Am J Clin Nutr 1997;66:633-8.*

10. Baum MK, Shor-Posner G, Lu Y, Rosner B, Sauberlich HE, Fletcher MA, Szapocznik J, Eisdorfer C, Buring JE, Hennekens CH. Micronutrients and HIV-1 disease progression. *AIDS 1995 Sep;(9)9:1051-6.*

11. Macallan DC. Nutrition and immune function in human immunodeficiency virus infection. *Proc Nutr Soc 1999 Aug;58(3):743-8.*

12. Tang AM, Graham NM, Kirby AJ, McCall LD, Willet WC, Saah AJ. Dietary micronutrient intake and risk of progression to acquired immunodeficiency syndrome (AIDS) in human immunodeficiency virus type 1 (HIV-1) - infected homosexual men. *Am J Epidemiol 1993*

Dec;138(11):937-51.

13. Tang AM, Graham NM, Saah AJ. Effect of micronutrient intake on survival in human immunodeficiency syndrome virus type 1 infection. *Am J Epidemiol. 1996; 143:1244-1256.*

14. Baum MK, Shor-Posner G. Micronutrient status in relationship to mortality in HIV-1 disease. *Nutr Rev 1998;56(1Pt2): S135-9.*

15. Allard JP, Aghdassi E, Chau J, Salit I, Walmsley S. Oxidative stress and plasma antioxidant micronutrient in humans with HIV infection. *Am J Clin Nutr 1998; 67:143-7.*

16. IVACG. Report of the XVIII International Vitamin A Consultative Group Meeting. Sustainable Control of Vitamin A Deficiency: Defining Progress Through Assessment, Surveillance, Evaluation. Cairo, Egypt. 22-26 September 1997.

17. IVACG. Report of XIX International Vitamin A Consultative Group Meeting. Vitamin A and Other Micronutrients: Biologic Interactions and Integrated Interventions. Durban, South Africa. 8-11 March 1999.

18. Mostad SB, Overbaugh J, De Vange DN, et al. Harmonal contraception vitamin A deficiency and other risk factors for shedding of HIV-1 infected cells from the cervix and vagina. *Lancet 1997; 350:922-927.*

19. Anonymous. Micronutrients: Their role in the management of the AIDS patient. *Medical Update Number 31,1998.*

20. Semba RD, Overview of the potential role of vitamin A in the mother to child transmission of HIV-1. *Acta Paediatr. Suppl.1997a; 86:107-112.*

21. Semba RD, Miotti PG, Chiphangwi JD et al. Maternal vitamin A deficiency during human immunodeficiency virus infection. *Clin Infect Dis 1997b; 21:966-972.*

22. Fawzi WW, Msamanga G1, Spiegelman D. Et al. Randomized trial of the effects of vitamin supplements on pregnancy outcomes and T cell counts in HIV-1-infected women in Tanzania. *Lancet 1998;351:1477-1482.*

APPENDIX

1. Safe Food preparation

- Wash hands with water and soap or ashes before food preparation
- Wash fruits and vegetables with, if possible, boiled water.
- Use fresh food.
- Boil your vegetables in a small amount of water and for a short time. Use the remaining vitamin-rich water for soups and sauces.
- Heat liquids until they start to bubble and cook the food until it is thoroughly heated, to kill any germs. Eat the food when it is still hot.
- Try to cook enough food for just one meal to avoid left overs.
- Thoroughly reheat food that has been kept after being cooked, even if it is still warm.
- Store water and food in clean, covered containers and in a cool place.
- Use boiled water for drinking and when making ice-cubes.

Adopted from Draft Guidelines for People Living with HIV/AIDS: Tanzania Food and Nutrition Centre, 1998.

2. Dietary guidelines for those who lost weight or for those who are at a risk of losing weight.

Eat small amount of food and eat often.

Add nuts, eggs, oil, milk/milk powder, margarine and fruits into different dishes to make them more nutritious.

Drink milk, fruit juices and soft drinks to increase your energy-intake.

Eat meals which contain food from each of these three groups.

- Legumes and animal products such as: beans, peas, nuts, meat, fish, eggs and milk.
- Cereals, roots and tubers such as: maize, rice, millet, wheat, sorghum, yams, cassava, potatoes and bananas.
- Fruits and vegetables such as: all fruits and vegetables, especially dark green leafy vegetables and orange coloured vegetables and fruits.
- Fats, oils and sugars.

3. Dietary Management of problems related to HIV/AIDS

3.1 Chewing and/or swallowing difficulties and painful mouth and/or throat.

- ☆ Eat mashed food
- ☆ Eat soft food like eggs, soups and porridge
- ☆ Use a small spoon or straw when eating or drinking
- ☆ Avoid spicy or acidic foods.
- ☆ Adding milk into fruit-juices can reduce acidity.
- ☆ Very hot food make swallowing difficulties worse.
- ☆ Ice-cubes reduce mouth pain, use boiled water if making ice-cubes.

3.2 Sore mouth and/or throat (caused by fungus).

- ☆ Eat soft, non-irritating foods, see 3.1
- ☆ Eat raw garlic, but too much may cause an upset stomach.
- ☆ Try yoghurt, it might lighten your troubles.
- ☆ Avoid large amounts of sugar-rich food.
- ☆ Brush and gargle your mouth with a mixture of boiled water, garlic and salt.

3.3 Poor appetite, taste changes and dry mouth

- ☆ Eat small and frequent meals and snacks.
- ☆ Eat and drink more when feeling better.
- ☆ Add small amounts of oil and fat to increase the energy content and to make the food easier to swallow.
- ☆ Eat your favourable dishes when that is possible.
- ☆ Put milk into different dishes and/or drinks, it is a good source of protein.
- ☆ Vary the flavour and texture of your food.
- ☆ Experience shows that lemon pepper and millet porridge increases the appetite.
- ☆ Small frequent drinks prevents dry mouth.
- ☆ Dip your bread in fluids like tea or milk, when you have a dry mouth.
- ☆ Avoid drinking with meals, it makes you eat less, try to drink between meals instead.
- ☆ If you don't feel like eating at all, treat food like medicine.
- ☆ Fresh air increases the appetite.
- ☆ Meal-times should be a relaxed and pleasant experience - try eating with friends or family.

3.4 Nausea and vomiting

- ☆ Eat small meals and eat them often
- ☆ Chew your food well.
- ☆ Try sour and/or salty foods, it may reduce nausea.
- ☆ Try soft and/or bland foods.
- ☆ Try to eat crispy and/or dry food-items before you stand up in the morning
- ☆ It is better to drink between meals rather than together with meals. A lot of fluid and food at the same time can cause vomiting.
- ☆ If you can't drink, try to suck on ice-cubes, if it is available.
- ☆ Avoid dehydration, drink frequent sips of fluids for example, fruit-juices, soft drinks and lemon water.
- ☆ Avoid greasy and spicy food.
- ☆ Avoid long periods without eating , as this can cause nausea.
- ☆ Try to rest after your meal, preferably with your head on a pillow.

3.5 Diarrhoea

- ☆ Drink more fluids than usual for example boiled water, coconut water, soup, fruit-juices and Oral Rehydration Solution (ORS). Try food-based fluids such as gruel, fermented porridge, soup and rice-water to avoid dehydration.
- ☆ Try boiled carrots or make soup from them.
- ☆ Eat small and frequent meals.
- ☆ Eat foods with a high potassium content such as cassava meal, bananas and dark green leafy vegetables.
- ☆ Chicken and fish are easier to digest than red meat.
- ☆ If milk gives you diarrhoea, try yoghurt.
- ☆ Fatty or oily foods may make your diarrhoea worse.
- ☆ Avoid irritating food such as raw vegetables.
- ☆ Avoid caffeine containing foods such as coffee, tea and chocolate, if that make your diarrhoea worse.
- ☆ Avoid drinking alcohol.
- ☆ Avoid foods that may cause gas or cramps such as carbonated drinks, beans, cabbage and highly spiced foods.

3.6 Constipation

- ☆ Drink a lot of boiled water and/or fruit-juices
- ☆ Eat a lot of fruits and vegetables.
- ☆ Eat unpolished food such as brown rice, brown stiff porridge and red millet.
- ☆ Experience shows that paw-paw helps.
- ☆ Try to improve your digestion
- ☆ Do physical exercise, it is good for your system.
- ☆ Try regular toilet habits and take your time.

3.7 Fever

- ☆ Drink plenty of fluids, see 3.5
- ☆ If you can't eat try food-based fluids, see 3.5
- ☆ Keep drinking-water nearby, sip some of it every five or ten minutes, even when you don't feel thirsty.