Overview and Nutritional Management of HIV/AIDS Patients

Learning Objectives:
1. Be able to define HIV and AIDS and distinguish between the two.
2. Have a basic understanding of HIV virology.
3. Learn how HIV is transmitted, including the fluids that transmit the disease.
4. Be able to interpret CD4 count and Viral Load.
5. Be able to define opportunistic infection.
6. Have an understanding of the goals of Antiretroviral Therapy and the side effects of ART drug use.
7. Become familiar with the nutrition implications associated with the disease and its treatment.
8. Have an understanding of the connection between HIV/AIDS and malnutrition.
9. Learn the importance of MNT and the goals of MNT in this patient population.
10. Become familiar with the common nutrition diagnoses in these patients and identify appropriate nutrition interventions.
11. Be able to define neutropenic diet and identify what this diet entails.
12. Understand the role of the Registered Dietitian in the care of this patient population.

HIV/AIDS Overview

I. What is HIV?
- **Human Immunodeficiency Virus** - *retrovirus* that causes progressive failure of the immune system, allowing life-threatening opportunistic infections and cancers to thrive. Eventually causes Acquired Immunodeficiency Syndrome
- HIV infects helper T cells (________), macrophages, and dendritic cells
  - These cells activate the immune response when they detect intruders
- HIV leads to low level of CD4 cells by binding to the surface and becoming a part of the cell
  - As CD4 cells multiply to fight infection, they make more copies of HIV
  - Leads to gradual decline of CD4 cell count; HIV takes over.
- When CD4 cell count declines below a critical level, cell-mediated immunity is lost and the body becomes progressively more susceptible to ____________________________.

II. HIV Virology
- Retrovirus carries its genetic material in the form of mRNA
- Targets a host cell
- Once inside the cell, the virus uses its own __________________________ enzyme to produce DNA from its RNA genome
  - Reverse of normal virus transcription and translation sequence
    - Normal virus: _______ → _______ → _______
  - The new DNA is then incorporated into the host cell’s genome by the integrase enzyme
- Now, the host cell treats the viral DNA as part of its own genome
  - Translates and transcribes the viral genes as the cell’s own genome continues, and new copies of the virus are made

III. HIV Incidence
- CDC estimates that _____________ are living with HIV in the US
- ~1 in 6 people (15.8%) are unaware of their infection
Over the past decade, the number of people living with HIV has increased

**IV. HIV Demographics**
- Gay, bisexual, and other men who have sex with men are most seriously affected by HIV
- AIDS affects nearly 7 times more _______________ and 3 times more _______________ than whites
- Estimated new # of HIV infections was highest among individuals aged 25-34 in 2010, followed by age group of 13-24.

**V. Transmission**
- Fluids of transmission include:
  - Blood
  - Semen/pre-seminal fluid
  - Vaginal fluid
  - Sweat, saliva, tears, and urine (CD4 Count) been shown to transmit HIV
- Fluids must come in contact with a mucous membrane, damaged tissue, or be directly injected into the bloodstream. HIV can enter the body through:
  - Lining of the anus, rectum, vagina and/or cervix
  - Opening to the penis
  - Mouth that has sores or bleeding gums
  - Cuts or sores
- Common ways HIV is transmitted:
  - Most common: Anal, vaginal, or oral sex
  - 2nd most common: Sharing needles with someone who is HIV+
  - Before or during birth
  - Through breastfeeding
  - Through transfusion of infected blood or blood clotting factors

**VI. Progression of HIV**
- Four Stages of HIV
  - Acute Infection
  - Clinical Latency
  - Symptomatic HIV Infection
  - _______________
- Two main biomarkers to assess disease progression are CD4+ T-cell Count (CD4 Count) and Viral Load

**CD4 Count**
- Used as major indicator of immune function; strongest predictor of disease progression
- Used to determine when to initiate ART

<table>
<thead>
<tr>
<th>CD4 Count (cells/mm3)</th>
<th>Classification</th>
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<tbody>
<tr>
<td>Normal</td>
<td></td>
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<tr>
<td>Symptomatic HIV (Stage III)</td>
<td></td>
</tr>
<tr>
<td>Start ART Treatment</td>
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<tr>
<td>Qualification for AIDS</td>
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**Viral Load**
- Level of HIV in the blood
  - Helps monitor disease progression, decide whether to start treatment
  - If viral load is __________, CD4 count is ________
No "normal" viral load
Antiretroviral medications work by keeping HIV from reproducing in the body, lowering viral load
  o Strongest indicator of the efficacy of ART

V. Stages of Infection
- Stage 1: Acute Infection
  o -------------------------------
  o 50% of people experience symptoms such as fever, malaise, myalgia, swollen lymph nodes for 2-4 weeks, but they subside after 1-2 weeks
  o Rarely diagnosed at this stage (symptoms too non-specific)
  o Large amounts of virus are being produced in the body
    ▪ Uses CD4 cells to replicate and destroys them in the process
    ▪ Eventually, viral set point: relatively stable level of virus in the body
  o High risk of spreading d/t high HIV levels in blood
- Stage 2: Clinical Latency
  o Virus is living and replicating in the body but symptoms are absent
  o Typically lasts _______________ for those not on Antiretroviral Therapy (ART)
    ▪ May live with clinical latency for decades if on ART
  o Can still transmit disease
- Stage 3: Symptomatic HIV
  o When CD4 count reaches <500
  o More susceptible to developing signs and symptoms
    ▪ Persistent fevers, chronic diarrhea, unexplained weight loss, loss of LBM with/without weight loss, thrush, herpes zoster, peripheral neuropathy
  o HIV has slowly broken down the immune system and it can no longer fight the virus
- Stage 4: ____________
  o Acquired Immune Deficiency Syndrome
  o When CD4 count __________________
  o Characterized by increased risk for opportunistic infections (OIs)
  o Can also be diagnosed with AIDS if one or more OIs develop without a low CD4 count
    ▪ CDC has named >20 OIs as diagnostic for AIDS
    ▪ Bacterial infections, viral infections, fungi, parasites

Chart depicts CD4 Levels and Viral Load over the course of an untreated infection.

Life Expectancy with AIDS
- Without treatment: ________________
Without treatment but WITH an opportunistic infection: 1 year
With ART: near normal lifespan! HIV most likely won’t progress to AIDS

Progression Factors
- Factors that shorten disease progression:
  - Older age, co-infection with other viruses, ____________________, severe stress, and genetic background
- Factors that delay disease progression:
  - Taking ART, staying in HIV care and listening to doctors, good nutrition status and LBM before becoming infected with HIV, genetic background

VI. Antiretroviral Therapy (ART)
- Sometimes called HAART- Highly Active Antiretroviral Therapy
- Introduced in 1996- changed HIV/AIDS outcomes dramatically
  - Overall AIDS-related deaths, ____________________, and incidence of opportunistic infections substantially declined
- Goal is to achieve and maintain viral suppression, reduce HIV-related morbidity and mortality, improve quality of life, and restore/preserve immune function
- >20 antiretroviral agents from 6 mechanistic classes of drugs
- Pts usually take 3+ ART medications
- Treatment is lifelong
  - Increases risks of side effects, toxicity, metabolic complications
- Multiple side effects
- Potential Drug-Nutrient Interactions
- Non-adherence can lead to drug resistance

Antiretroviral Drug Classes
- Nucleoside and nucleotide reverse transcriptase inhibitors (NRTIs)
- Nonnucleoside reverse transcriptase inhibitors (NNRTIs)
- Protease Inhibitors (PIs)
- Fusion Inhibitors
- Chemokine receptor 5 (CCR5) antagonists
- Integrase strand transfer inhibitors (INSTIs)
- A regimen that includes a __________________ of drug classes used most often to combat the disease in multiple ways and to prevent drug resistance
  - NRTIs
    - Emtricitabine (Emtriva)
    - Lamivudine (Epivir)
    - Zidovudine (Retrovir)
    - Abacavir, lamivudine, and zidovudine (Trizivir)
    - Didanosine (Videx)
    - Tenofovir (Viread)
    - Stavudine (Zerit)
  - NNRTIs
    - Etravirine (Intelect)
    - Delavirdine (Rescriptor)
    - Efavirenz (Sustiva)
    - Nevirapine (Viramune)
  - PIs
    - Amprenavir (Agenerase)
    - Tipranavir (Aptivus)
    - Indinavir (Crixivan)
    - Lopinavir, ritonavir (Kaletra)
    - Foramprenavir (Lexiva)
    - Ritonavir Norvir
    - Darunavir (Prezista)
    - Atazanavir (reyzataz)
    - Fortovase soft gel (saquinavir)
    - Nelfinavir (Viracept)
  - CCR5 antagonists
    - Selzentry (Maraviroc)
    - Fusion Inhibitors
    - Enfuvirtide (Fuzeon)
    - Integrase Inhibitors
    - Isentress (Raltegravir)
Common side effects of ART

- N/V/D/C
- GERD
- Fatigue
- Gas
- Taste changes; especially metallic
- Dry mouth
- Decreased appetite
- Low Zn, Cu, B12 (with NRTIs)
- Dyslipidemia
- Hypertriglyceridemia
- Hyperglycemia
- Insulin Resistance
- Fat maldistribution (especially with PIs)
- Mouth/esophageal ulcers
- Anemia
- Hepatotoxicity

Costs of ART

- As of 2006, ART averaged __________________/year per patient
- But, studies show that ART is highly cost-effective
  - Sicker HIV-infected patients have a total annual health care expenditure 2.5 times higher than healthier ones

VII. Opportunistic Infections (OIs)

- Infections that do not generally occur in healthy individuals with strong immune systems
  - Called “opportunistic” because they take advantage of the opportunity to infect a weakened immune system
- Can be fatal in people living with HIV/AIDS
- ART can help prevent OIs by increasing the number of CD4 cells

Most Common OIs Include:

- Tuberculosis- bacterial infection that affects the lungs but can spread to other organs
- Kaposi’s sarcoma- can cause lesions on the body and in the mouth, or even affect internal organs and spread to rest of body without external signs
- __________________ - fungal infection of the mucus membrane lining the mouth and tongue
- Cryptosporidiosis- parasitic infection of the small intestine that causes severe chronic diarrhea. Can lead to severe loss of muscle mass and malnutrition

VIII. Possible Comorbidities of HIV/AIDS

<table>
<thead>
<tr>
<th>Comorbidity Domains</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-infections</td>
<td>Hepatitis, herpes tuberculosis, other OIs</td>
</tr>
<tr>
<td>AIDS-defining cancers</td>
<td>Kaposi’s Sarcoma, cervical cancer, non-Hodgkin’s lymphoma</td>
</tr>
<tr>
<td>Non-AIDS defining cancers</td>
<td>Lung, anal, or liver cancer, Hodgkin’s lymphoma</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>Heart attack, stroke</td>
</tr>
<tr>
<td>Neurological issues</td>
<td>Cognitive decline, neuropathic pain</td>
</tr>
<tr>
<td>Mental health and addiction issues</td>
<td>Substance misuse, depression, anxiety</td>
</tr>
<tr>
<td>Blood Disorders</td>
<td>Hemophilia, anemia, hemochromatosis, leukemia, thrombosis</td>
</tr>
<tr>
<td>Bone disorders</td>
<td>Osteopenia, osteoporosis</td>
</tr>
<tr>
<td>Metabolic Disorders</td>
<td>Lipodystrophy, hyperlipidemia, hyperglycemia → T2DM</td>
</tr>
<tr>
<td>Kidney Disease</td>
<td>n/a</td>
</tr>
<tr>
<td>Neurological issues</td>
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</table>
IX. Pregnancy, Breastfeeding, and Transmission
- Mother-to-child transmission can occur during pregnancy labor or delivery, or through breastfeeding
- Without ART, there is a ____% chance of mom passing the virus on to baby during pregnancy or delivery
- ______% chance of passing virus to baby through breastfeeding
- Some ART medications do cross the placenta
- Baby often receives ART treatment (syrup form) for four weeks after birth

Pregnancy Recommendations
CDC recommends:
-Starting ART before trying to get pregnant
-Taking ART throughout pregnancy and delivery
-Delivering baby via C-section
-Avoiding breastfeeding if there is a safe alternative
Complying with all above recommendations: _______________ of passing the infection to baby

HIV/AIDS and Malnutrition

I. Suspected Mechanisms of Malnutrition
- Inadequate dietary intakes
  - Can result from: anorexia, nausea, taste changes, OIs, depression
- _______________
  - Can result from: diarrhea, vomiting
- Metabolic changes
  - Immune system working harder → increased requirements
  - Insulin resistance
  - Lipodystrophy
  - Reduced intestinal absorption d/t damage in villi, inflammation
*Malnutrition, specifically wasting, is an important predictor of HIV progression

II. Possible Nutrition Implications
- Decrease in LBM
- Persistent N/V/D
- Anorexia
- Weight Loss
- Malabsorption
- HIV-Induced Encephalopathy (__________________) - degenerative disease of the brain caused by HIV infection
  - Inability to prepare food and feed self
- HIV-Induced Enteropathy - effect of HIV on enteric mucosa
  - Chronic diarrhea, decreased appetite, weight loss, malabsorption, changes in cognition
- Kaposi’s Sarcoma
  - Lesions in mouth or esophagus: difficulty chewing and swallowing
  - Lesions in intestine: obstruction and diarrhea
- Cytomegalovirus
• Enteritis, colitis, weight loss, decreased appetite
• Tuberculosis
  • Malabsorption, weight loss, altered metabolism, fatigue, anorexia
• Pneumocystis pneumonia (PCP)
  • Difficulty chewing and swallowing caused by SOB
• ________________
  • Cramping, electrolyte imbalances, diarrhea, weight loss
• Thrush/Candidiasis
  • Yeast infection - causes mouth and esophageal sores, difficulty chewing/swallowing, taste changes

III. Long-Term Nutrition Implications
• HIV-associated lipodystrophy syndrome (HALS) - abnormal distribution and metabolism of fat
  • Fat redistribution, insulin resistance, hypertriglyceridemia
  • Excess fat accumulation or loss in various parts of the body - increased fat in trunk, loss of fat in face and extremities common
  • With access to ART, new nutrition issues have arisen due to HALS
    • HIV-related death has shifted from OIs to chronic diseases: heart disease and diabetes
• AIDS-Related ____________________________
  • 10% weight loss in 6 months with
  • Diarrhea >30 days without known cause OR
  • Fever and chronic weakness >30 days in the absence of a concurrent illness other than HIV that would explain the findings

Medical Nutrition Therapy

I. Importance of MNT
• Malnutrition with HIV infection has been associated with:
  • Increased mortality
  • Accelerated disease progression
  • Loss of muscle protein mass
  • Impairment of strength and functional status
• An unintentional weight loss as little as 5% has been associated with increased morbidity and mortality

II. Goals of MNT
• Optimize nutrition status, immunity, and well-being
• Maintain a healthy weight and lean body mass
• Prevent nutrient deficiencies
• Reduce the risk of co-morbidities
• Maximize the effectiveness of medical and ART treatments
III. Nutrition Assessment

Factors to Consider:

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<th>Comorbidity Domains</th>
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<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Factor</strong></td>
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</tbody>
</table>
| Medical             | Stage of HIV disease  
|                     | Comorbidities  
|                     | Presence of Opportunistic Infection  
|                     | Metabolic complications  
|                     | Biochemical measurements  
| Physical            | Changes in body shape  
|                     | Weight or growth concerns  
|                     | Oral or GI symptoms  
|                     | Functional Status  
|                     | Anthropometrics  
| Social              | Living environment (support from family/friends)  
|                     | Behavioral concerns or unusual eating habits  
|                     | Mental health (depression?)  
| Economical          | Barriers to nutrition (access to food, financial resources)  
| Nutritional         | Typical intake  
|                     | Food shopping and preparation  
|                     | Food allergies and intolerances  
|                     | Vitamin, mineral, and use of other supplements  
|                     | Alcohol and drug use  

IV. Energy Recommendations

- Individuals with well-controlled HIV: mirror same recommendations as healthy individuals
  - Establish the individual’s need to gain, lose, or maintain weight
- Vary considerably on case to case basis
  - Could use 25-45 kcal/kg UBW OR Harris Benedict with stress factor of 1.2-1.8
  - After an OI, nutritional requirements increase by 20%-50%
- Increased REE common in pts with HIV, especially those with OIs, but TEE actually decreases
  - Decrease in TEE illustrates that HIV more significantly decreases the infected person’s activity level and energy intake
  - Decreased energy intake = primary contributor to wasting

V. Protein Recommendations

- Much like energy recommendations, vary from case to case basis
  - Must consider comorbidities, presence of OI
- Current DRI of 0.8 g/kg BW recommended
  - Deficiency of protein stores and altered protein metabolism occur in HIV/AIDS patients, but no clinical evidence exists support increasing the proportion of protein above normal levels
- With presence of OI, additional 10% is recommended d/t increased protein turnover

VI. Fluid Recommendations

- Standard requirements to meet needs: 30-35 ml/kg body weight
- Consider increasing fluid requirements with fever, N/V/D, exercise
- Caffeinated beverages do not count
**VII. Exercise Recommendations**
- LBM is very important in helping the body resist OIs and to recover after infection
- HIV wasting depletes LBM
- Resistance exercise important!

**VIII. Common Nutrition Diagnoses**
- Inadequate oral food and beverage intake
- Increased nutrient needs
- Swallowing difficulty
- Altered GI function
- Food-medications interaction
- Involuntary weight loss
- Overweight and obesity
- Food and nutrition-related knowledge deficit
- Over-supplementation
- Impaired ability to prepare foods or meals
- Inadequate access to food
- Intake of unsafe foods

**IX. Nutrition Interventions**
- **Diarrhea**
  - Bland foods
  - Avoid fatty, greasy, or spicy foods
  - Limit caffeine
  - Low-fiber fruits (like applesauce and bananas)
  - Avoid dairy products
  - Replace electrolytes with oral hydration drinks and broths
- **N/V**
  - Keep log of the causes
  - Small, frequent meals
  - Bland foods (rice, potatoes)
  - Limit high-fat, greasy foods
  - Avoid foods with strong odors
  - Cool and clear liquids
  - Scheduling anti-emetics
  - Use spices and herbs
  - Avoid canned foods and canned oral supplements
  - Use plastic utensils
- **Weight Loss**
  - Nutrient-dense foods
  - Milkshakes, lean protein, vegetables, fruits, whole grains, trail mixes
  - Add dry milk or protein powder to oatmeal, casseroles, milkshakes
  - Add rice, barley, and legumes to soups
  - Oral supplements
  - Small frequent meals
  - Soft foods
  - Oatmeal, scrambled eggs, milkshakes, applesauce
  - Avoiding spicy or acidic foods
  - Moisten foods with gravies and sauces
  - Watch temperature of foods- cold and room temperature foods often more accepted
  - Use a straw
- Decreased Appetite
  - Mild exercise to stimulate appetite
  - Small, frequent meals
  - Avoid drinking too much right before or during meals
  - Avoid carbonated drinks
  - Eat with company
  - Choose favorite foods
  - Appetite Stimulants
    - Megestrol acetate
      - Appetite stimulant that effectively increases weight
      - Weight gain is predominantly exclusively fat
      - May exacerbate DM
      - In a large study of 271 male patients with AIDS wasting, those receiving 800 mg of megestrol acetate per day consumed ~500 kcal more/day and gained ~4 kg compared with placebo-treated patients, in association with an improved quality of life
    - Dronabinol
      - Primary active compound in marijuana- approved by FDA for HIV-associated anorexia
      - In a RDBPC multicenter trial in patients with HIV-associated weight loss, treatment with dronabinol (2.5 mg BID) produced significant increases in self-reported appetite and decreases in nausea but did not significantly increase weight over a 6-week blinded treatment period

X. Food Safety
- Contaminated food = more serious consequences for persons with HIV/AIDS
- Avoid raw or undercooked meats, seafood, and eggs
  - Includes ____________ and ____________.
- Ensure only pasteurized milk and cheese products, juices
- Prevent cross-contamination: use separate cutting boards for raw meats
- Wash fruits and vegetables
- Wash hands

XI. Neutropenic Diets
- Also known as an Immunocompromised Diet
- Generally recommended for patients with a WBC count <500 cells/mm3
- Eliminates raw fruits and vegetables, meat cooked less than well done, cured meats, yogurt, aged cheese and prepared salads

Role of the RD
- Assess patient’s nutrition status by looking at weight history, medications, lab values, presence of OIs, etc.
- Determine nutrition-related goals for patients, including weight gain/loss/maintenance goals and exercise goals
- Provide appropriate interventions based on nutrition-related goals
- Provide recommendations to improve nutritional status, immunity, and quality of life
- Address DNIs and manage side effects of ART
- Identify barriers to desirable food intake
- Encourage adherence to ART

**Summary**

- People living with HIV experience high rates of comorbidities associated with HIV and/or with ART treatments
- The specific MNT should be *individualized* for each patient as there are multiple comorbidities, medications, and opportunistic infections that affect nutrition status
- To prevent loss of weight and LBM, all HIV-infected patients should be encouraged to maintain adequate energy intake and engage in moderate exercise
References