Importance of Weight in Treating a Person with TB
Catalina Navarro, RN, BSN
September 14, 2017

TB Nurse Case Management
September 12-14, 2017

Catalina Navarro, RN, BSN has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity
Importance of Weight in Treating a Person with TB

Nurse Case Management

San Antonio, TX September 14, 2017

Catalina B. Navarro RN, BSN
Nurse Consultant/Educator

Objectives

• Discuss the Importance of Nutrition in TB Treatment and impact on TB outcomes

• Demonstrate the used of the BMI chart with case studies
Why Nutrition is Important in a Person with TB?

Nutrition and TB

“Rise in tuberculosis mortality was recorded in 1914-1916, and in those years the consumption of bread and flour rose, whereas that of meat decreased.”

“High TB mortality in Europe during and since WWII, coincided with great reduction of intake of protein food, such as, meat, fish and eggs”

Sandler MD (Diet Prevents Polio)
People suffering from undernutrition are predisposed to contracting TB while TB can contribute to undernutrition. In India, undernutrition contributes to a staggering 55% of the annual TB incidence.

How Was TB Treated Prior to 1950?

Nutritious Food
Rest
Sunshine
Fresh Air
“The Consumptive Working Man”

1906

CONCLUSIONS: VALUE OF SANATORIUM TREATMENT. 161

After Periods Varying from One to Five and a Half Years after Discharge.

<table>
<thead>
<tr>
<th>No. of Cases Treated</th>
<th>In Normal Health and Full Work</th>
<th>Little or no Work, and in Poor or only Fair Health</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Durham, 303</td>
<td>41%</td>
<td>19%</td>
<td>10%</td>
</tr>
<tr>
<td>At Westminster, 128</td>
<td>38%</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>At Morley and Sheffield, 38</td>
<td>41%</td>
<td>19%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Vitamin A May Help Boost Immune System to Fight Tuberculosis

Nutrient lowers intracellular cholesterol used by TB to sustain infection

UCLA Researchers

UCLA’s Elliott Kim, Philip Liu and Avelino De Leon

February 25, 2014
MTB is Extraordinarily Sensitive to Killing by a vitamin C-induced Fenton Reaction

Researchers found that, in the presence of even minimally adequate levels of vitamin D, the body’s own immune system will naturally trigger an immune response against the TB.

Vitamin D Powerful Weapon Against TB

Researchers found that, in the presence of even minimally adequate levels of vitamin D, the body’s own immune system will naturally trigger an immune response against the TB.
**Malnutrition and TB**

- Loss of appetite
- Weight loss
- Malnutrition
- Increase susceptibility to infection
- Increase risk from LTBI to TB disease
- Weaken immune system
Importance of Nutrition in TB Treatment Response

Lack of Weight gain & Relapse Risk in a Large Tuberculosis Treatment Trial.


Impact of Poor Nutrition on TB Relapse

Weight gain of 5% or less during the first 2 months of therapy is associated with an increased risk of relapse, even after controlling for other factors.

Consultation to healthcare providers at 1-800-TEX-LUNG

www.HeartlandNTBC.org

Khan Am J Resp Crit Care Med 2006
Importance of Nutrition in TB Treatment Response

• The relationship between nutritional status and poor outcomes for patients with TB.

• The association of weight gain between diagnosis and the end of 2-month Initial Phase therapy and risk of relapse

Definition of TB Relapse

Patients remain culture negative during treatment but after completion of therapy they become again culture positive or show clinical or radiographic deterioration consistent with active TB.
Importance of Nutrition in TB Treatment Response

- 857 subjects were enrolled.
- Monitored for two (2) years.
- Body weight (kg) was measured at:
  - diagnosis
  - Enrollment in study
  - Monthly during treatment
  - And every 3-6 months during follow-up
- Height
- BMI (Body Mass Index)
- IBW (Ideal Body Weight)

Lack of Weight Gain and Relapse Risk, (TBTC Study 22)

Results

- 61 patients relapsed (7.1%)
- Relapse risk high:
  - In those underweight at diagnosis 19.1% versus 4.8%
  - Those with BMI <18.5 19.5 % versus 5.8%
- Among pts underweight at Dx, weight gain ≤ 5% after 2 mo Therapy:
  - Relapse risk 18.4% vs. 10.3%
  - If also cavitary disease: 18.9%
  - If cavitary and + 2 months culture: 50.5%

To Remember....

Patients 10% below ideal body weight at diagnosis have a **20% chance of relapse** if they don’t regain at least 5% by end of two months of Rx

If Chest X-ray cavitary & 2 months sputum culture +, 50% chance of relapse

**RELAPSE PREVENTION**
Assessing Nutritional Status in a Person with TB

Albumin: 3.8 – 5.2 g/dl
(Major protein. Low levels in poor diets, fever, infection, ↓ iron intake

Total Protein: 6.0-8.5 g/dl
(Low levels indicate poor nutrition. Increase levels can be seen in liver disease, chronic infections and TB.

Hemoglobin: 11.5 – 16 g/dl ♂️ 13.2 – 17.1 g/dl ♀️

Hematocrit: 36.0 – 45.0 % ♂️ 38.5 – 50.5 % ♀️

Glucose: 65 – 110 mg/dl

WBC: 3.8 – 10.8

Lymph: 18-48 %
(decreases with progressive malnutrition)
## Body Mass Index (BMI)

### Chart 1: Body Mass Index (BMI)

- **<18.5** underweight *
- **18.5-24.9** normal weight
- **25-29.9** overweight
- **>30** obese

### Ideal Body Weight Table

**Metropolitan Life Table for Medium Frame Adult**

<table>
<thead>
<tr>
<th>Height in Shoes</th>
<th>Ideal Weight For Women</th>
<th>Medium Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'6&quot;</td>
<td>148 to 162 lbs</td>
<td></td>
</tr>
<tr>
<td>5'11&quot;</td>
<td>142 to 159 lbs</td>
<td></td>
</tr>
<tr>
<td>5'10&quot;</td>
<td>142 to 156 lbs</td>
<td></td>
</tr>
<tr>
<td>5'9&quot;</td>
<td>139 to 153 lbs</td>
<td></td>
</tr>
<tr>
<td>5'8&quot;</td>
<td>136 to 150 lbs</td>
<td></td>
</tr>
<tr>
<td>5'7&quot;</td>
<td>133 to 147 lbs</td>
<td></td>
</tr>
<tr>
<td>5'6&quot;</td>
<td>130 to 144 lbs</td>
<td></td>
</tr>
<tr>
<td>5'5&quot;</td>
<td>127 to 141 lbs</td>
<td></td>
</tr>
<tr>
<td>5'4&quot;</td>
<td>124 to 138 lbs</td>
<td></td>
</tr>
<tr>
<td>5'3&quot;</td>
<td>121 to 135 lbs</td>
<td></td>
</tr>
<tr>
<td>5'2&quot;</td>
<td>118 to 132 lbs</td>
<td></td>
</tr>
<tr>
<td>5'1&quot;</td>
<td>115 to 129 lbs</td>
<td></td>
</tr>
<tr>
<td>5'</td>
<td>113 to 126 lbs</td>
<td></td>
</tr>
<tr>
<td>4'11&quot;</td>
<td>111 to 123 lbs</td>
<td></td>
</tr>
<tr>
<td>4'10&quot;</td>
<td>108 to 121 lbs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Height in Shoes</th>
<th>Ideal Weight For Men</th>
<th>Medium Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'4&quot;</td>
<td>171 to 187 lbs</td>
<td></td>
</tr>
<tr>
<td>6'3&quot;</td>
<td>167 to 182 lbs</td>
<td></td>
</tr>
<tr>
<td>6'2&quot;</td>
<td>164 to 178 lbs</td>
<td></td>
</tr>
<tr>
<td>6'1&quot;</td>
<td>160 to 174 lbs</td>
<td></td>
</tr>
<tr>
<td>6'</td>
<td>157 to 170 lbs</td>
<td></td>
</tr>
<tr>
<td>5'11&quot;</td>
<td>154 to 166 lbs</td>
<td></td>
</tr>
<tr>
<td>5'10&quot;</td>
<td>151 to 163 lbs</td>
<td></td>
</tr>
<tr>
<td>5'9&quot;</td>
<td>148 to 160 lbs</td>
<td></td>
</tr>
<tr>
<td>5'8&quot;</td>
<td>145 to 157 lbs</td>
<td></td>
</tr>
<tr>
<td>5'7&quot;</td>
<td>142 to 154 lbs</td>
<td></td>
</tr>
<tr>
<td>5'6&quot;</td>
<td>139 to 151 lbs</td>
<td></td>
</tr>
<tr>
<td>5'5&quot;</td>
<td>136 to 148 lbs</td>
<td></td>
</tr>
<tr>
<td>5'4&quot;</td>
<td>133 to 141 lbs</td>
<td></td>
</tr>
<tr>
<td>5'3&quot;</td>
<td>131 to 141 lbs</td>
<td></td>
</tr>
</tbody>
</table>

*Data from height and weight tables of the Metropolitan Life Insurance Company, 1983. The ideal weight figures in these tables are for ages 25 to 59. The weights assume persons wearing shoes with 9-inch heels and with clothing weighing 5 pounds.
How to calculate the % IBW?

\[
\text{% IBW} = \frac{\text{Actual Body Weight}}{\text{Ideal Body Weight}} \times 100
\]

Mr. B. Height: 5'4" Weight: 109 lb.

IBW (See chart): 140 lb

\[
\frac{109 \text{ lb.}}{140 \text{ lb.}} \times 100 = 77.8 \%
\]

22.2 % IBW

Using IBW

<table>
<thead>
<tr>
<th>Weight Classification</th>
<th>Percentage of IBW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal Survival</td>
<td>48 – 55%</td>
</tr>
<tr>
<td>Severely Underweight</td>
<td>&lt; 75%</td>
</tr>
<tr>
<td>Underweight</td>
<td>75 – 84%</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>85 – 119%</td>
</tr>
<tr>
<td>Overweight</td>
<td>120 – 129%</td>
</tr>
<tr>
<td>Obese</td>
<td>130 – 140%</td>
</tr>
<tr>
<td>Morbidly Obese</td>
<td>&gt; 140 %</td>
</tr>
</tbody>
</table>
Body mass index predictive of sputum culture conversion among MDR-TB patients in Indonesia.

Compared to patients with normal weight (BMI ≥18.5), severely underweight patients (BMI <16 ) had longer time to initial conversion and a lower probability of sputum culture conversion within 4 months.

Conclusion:
Severe underweight was associated with longer time to initial sputum culture conversion among MDR-TB patients.

Nutritional Teaching TIPS!

- Consider prolonging therapy for patients >10% underweight.
- Calculate BMI and IBW %
- Monitor weight weekly in underweight patients.
- Once stable, monitor monthly
- Ideally patients should gain 1 lb/week
- Provide food resources
- Recommend iron-rich food intake if client is anemic
- Recommend intake of food sources of Vit D (fish, butter, milk etc)
- Encourage the patient to monitor his/her weight.
Liliana’s Story

In October 2008, Liliana was excitedly preparing for her wedding. Throughout that year, she had been working very hard and going to the gym so she would look her best for the wedding. But shortly before her wedding date, she started coughing...

https://www.cdc.gov/tb/topic/basics/personalstories.htm

Case Study  # 1
**Case Study**

42 year old Hispanic male admitted to TCID on 10/30/12

- Chronic diarrhea, severe malnutrition, having difficulty walking, generalized weakness, limited social and family support
- 60Lb weight loss
- Disseminated TB involving lungs and bowel

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**Nutritional Assessment**

**Case study # 1**

MC, 42 y/o Hispanic male
Admitted on 10/30/2012

**Diagnosis:** Disseminated TB (lungs and bowel), DM, Chronic diarrhea, severe malnutrition

<table>
<thead>
<tr>
<th>Age: 42</th>
<th>Sex: M</th>
<th>Ht: 5'7&quot;</th>
<th>Wt: 77.8</th>
<th>Usual Body Weight: 142 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Size: Medium</td>
<td>Ideal Body Weight: 142 Lb</td>
<td>% IBW: 54.7</td>
<td>BMI: 12.2</td>
<td>Classification: Severely underweight</td>
</tr>
</tbody>
</table>

**Labs:**

- ALB: 2.0
- Hgb: 9.7
- Hct: 26.3
- GLUC: 161
- WBC: 4.2
- Hgb A1C 13.4%

**Risk Factors:**

- >20% underweight
- Disseminated TB
- GI TB
- Poorly control diabetes
- Smoker
- Lack of family support
Nutritional Assessment
Follow Up Case # 1

Diet advance slowly, pt. refuses to eat meals on regular basis, several episodes of hypoglycemia. Severe metabolic acidosis. D/C on 11/14/2013 (1 year of Rx)

<table>
<thead>
<tr>
<th>Age:</th>
<th>Sex:</th>
<th>Ht:</th>
<th>Wt:</th>
<th>Usual Body Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>M</td>
<td>5'7&quot;</td>
<td>114 Lb</td>
<td>142 Lb</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frame Size:</th>
<th>Ideal Body Weight:</th>
<th>% IBW:</th>
<th>BMI:</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>142 Lb</td>
<td>80 %</td>
<td>18</td>
<td>underweight</td>
</tr>
</tbody>
</table>

Labs:
- ALB: 2.0 3.2
- Hgb: 9.7 12.1
- Hct: 26.3 35.2
- GLUC: 161
- WBC: 4.2 4.8
- Hgb. A1C 13.4%

- Chronic pancreatitis/pancreatitis insufficiency
- Chronic condition, not reversible medication lifelong

High risk of relapse

Case Study # 2
# Nutritional Assessment

## Case study # 2

**JS, 45 y/o male**

**Admitted on 08/25/2010**

**Diagnosis** Pulmonary TB, HIV

### Age: 45  
**Sex:** M  
**Ht:** 5'4"  
**Wt:** 91 Lb  
**Usual Body Weight:** 136 Lb.

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Ideal Body Weight:</th>
<th>% IBW:</th>
<th>BMI:</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>135 Lb</td>
<td>67.4 %</td>
<td>16</td>
<td>Underweight/ SeVERely underweight</td>
</tr>
</tbody>
</table>

### Labs:

- **ALB:** 2.1  
- **Hgb:** 9.7  
- **Hto:** 27.9  
- **GLUC:** 102  
- **WBC:** 3.2

### Risk Factors:

- ->20% underweight  
- Infectious disease  
- HIV  
- Hepatitis C  
- Alcohol abuse  
- Homeless

### Nutritional Assessment

## Follow Up Case # 2

Encourage adequate protein and calories to meet needs. Pt loves eggs. 3 eggs given every meal. (After two months)

### Age: 45  
**Sex:** M  
**Ht:** 5'4"  
**Wt:** 126 Lb  
**Usual Body Weight:** 136 Lb.

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Ideal Body Weight:</th>
<th>% IBW:</th>
<th>BMI:</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>135 Lb</td>
<td>93 %</td>
<td>21</td>
<td>Appropriate weight</td>
</tr>
</tbody>
</table>

### Labs:

- **ALB:** 3.9  
- **HGB:** 14.3  
- **HTO:** 42.1  
- **GLUC:** 108  
- **WBC:** 5.3
Case Study # 3

Nutritional Assessment

Case study # 3

BR, 64 y/o male from India
Admitted on 07/28/2009
Diagnosis: Pulmonary TB

<table>
<thead>
<tr>
<th>Age: 64</th>
<th>Sex: M</th>
<th>Ht: 5'7&quot;</th>
<th>Wt: 104.2 Lb</th>
<th>Usual Body Weight: 155 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Size: Medium</td>
<td>Ideal Body Weight: 148 Lb</td>
<td>% IBW: 70 %</td>
<td>BMI: 16</td>
<td>Classification Underweight/Severely underweight</td>
</tr>
</tbody>
</table>

Labs:

<table>
<thead>
<tr>
<th>ALB: 2.3</th>
<th>Hgb: 11.3</th>
<th>Hct: 34.2</th>
<th>GLUC: 115</th>
<th>WBC: 20.9</th>
</tr>
</thead>
</table>

Risk Factors:
- >20% underweight
- GI problems
- Infectious disease
- Dysphagia (laryngeal mass)
Nutritional Assessment
Follow Up Case # 3

PEG tube was placed. Diet advance slowly. Started with liquids, soft diet, pureed etc
Discharged: Feb 2010

<table>
<thead>
<tr>
<th>Age:</th>
<th>Sex: M</th>
<th>Ht: 5'7&quot;</th>
<th>Wt: 136 Lb</th>
<th>Usual Body Weight: 155 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>Medium</td>
<td>148 Lb</td>
<td>91 %</td>
<td>Classification Appropriated weight</td>
</tr>
</tbody>
</table>

Labs:
ALB: 3.7
Hgb: 12.3
Hct: 37.6
GLUC: 108
WBC: 7.8

Case Study # 4
## Nutritional Assessment Case study # 4

AE, 62 Y/O female  
Admitted on 11/05/08  
Diagnosis Pulmonary TB  
Short bowel syndrome TPN

<table>
<thead>
<tr>
<th>Age: 62</th>
<th>Sex: F</th>
<th>Ht: 5’3”</th>
<th>Wt: 116 Lb</th>
<th>Usual Body Weight: 122 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Size: small</td>
<td>Ideal Body Weight: 128 Lb</td>
<td>% IBW: 90 %</td>
<td>BMI: 21</td>
<td>Classification Appropriate weight</td>
</tr>
</tbody>
</table>

### Labs:

| ALB: 3.0 | Hgb: 11.0 | Hct: 33.6 | GLUC: 83 | WBC: 6.4 |

### Risk Factors:

-10% underweight  
- Infectious disease  
- Mal absorption  
- Low levels of meds  
- TPN

---

## Nutritional Assessment Follow Up Case # 4


<table>
<thead>
<tr>
<th>Age: 62</th>
<th>Sex: F</th>
<th>Ht: 5’3”</th>
<th>Wt: 138 Lb</th>
<th>Usual Body Weight: 122 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Size: Medium</td>
<td>Ideal Body Weight: 128 Lb</td>
<td>% IBW: 107 %</td>
<td>BMI: 24.5</td>
<td>Classification overweight/ Appropriate weight</td>
</tr>
</tbody>
</table>

### Labs:

| ALB: 3.9 | Hgb: 14.3 | Hct: 42.1 | GLUC: 108 | WBC: 5.3 |

### Update:

Pt keeps her weight up.
Case Study # 5

Nutritional Assessment
Case study # 5

VW, 45 y/o male
Admitted on 01/07/2009

Diagnosis Pulmonary TB HIV

<table>
<thead>
<tr>
<th>Age: 45</th>
<th>Sex: M</th>
<th>Ht: 5'8&quot;</th>
<th>Wt: 119 Lb</th>
<th>Usual Body Weight: 179 Lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Size: Ideal Body Weight:</td>
<td>% IBW:</td>
<td>BMI:</td>
<td>Classification</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>154 Lb</td>
<td>77 %</td>
<td>17</td>
<td>Underweight</td>
</tr>
</tbody>
</table>

Labs:
- ALB: 2.8
- Hgb: 8.8
- Hct: 26.7
- GLUC: 111
- WBC: 5.5

Risk Factors:
- >20% underweight
- Infectious disease
- HIV
- Alcohol abuse
- Homeless
Nutritional Assessment
Follow Up case # 5

VW, 45 y/o male
Admitted on 01/07/2009

Age: 45
Sex: M

Frame Size: Medium
Ideal Body Weight: 154 Lb

<table>
<thead>
<tr>
<th>January/09</th>
<th>February/09</th>
<th>March/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>119 lb</td>
<td>149 lb</td>
<td>166 lb</td>
</tr>
</tbody>
</table>

Labs:
ALB: 3.8
Hgb: 12.4
Hto: 35.7
GLUC: 118
WBC: 4.6

Update:
D/C on April 2010
Weight: 165 Lb 107 % IBW
BMI: 25 Normal weight / Overweight

Questions?