Pre-ART nutritional status and its association with mortality in adult patients enrolled on ART at Fiche Hospital in North Shoa, Oromia Region, Ethiopia: A five year retrospective cohort study (2006-2013).

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• Methods and Materials
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Introduction

- HIV/AIDS continues to be a major global health priority
- HIV prevalence in Ethiopia accounts 1.5% of the population age 15-49 HIV positive. (EDHS, 2011).
- Provision of antiretroviral therapy (ART) for HIV-infected individuals is rapidly expanding in sub-Saharan Africa (WHO, 2011).
- Many studies have reported high early mortality among patients starting antiretroviral treatment in sub-Saharan Africa (Lawn SD et al., 2008).
Introduction cont…

• There is a vicious cycle between HIV infection and nutritional status.

• HIV compromises the nutritional status of infected individuals

• Malnutrition worsens the effects of the infection itself by weakening the immune system consequently accelerating disease progression and death (WHO, 2009).

• An improved understanding of the role of nutritional status in HIV disease progression may help in the development of strategies to reduce mortality after ART initiation.
Conceptual framework

- Opportunistic infections (OIs)
  - OIs prophylaxis
- Condom use
  - Addictions
  - Counseling
- Gender
- Age
- Religion
- Employment status
- Educational status
- Marital status
- ART regimens
  - ART adherence
  - ART side effect
  - Duration on ART
- WHO clinical stage
  - Functional status
  - Past TB history
- Nutritional status (BMI)
  - Hemoglobin level
  - CD4 cell count
- Time to Death
  (Survival Status)
Objectives

General objective:
• To assess Pre-ART nutritional status and its association with mortality in adult patients enrolled in ART between 2006-2013 at Fiche Hospital in North Shoa, Ethiopia.

Specific objectives:
• To identify pre-ART nutritional status and estimate time to death of patients who are on ART.
• To determine factors affecting mortality in patients after initiation of ART.
Methods and Materials

Study area and period:

- The study was conducted in Fiche Hospital from Jan 01-31/2014.

- Fiche is located about 112 km from the capital, Addis Ababa.

Study design: Retrospective cohort study design.

Source population:

- Peoples’ living with HIV/AIDS (PLWHA), age ≥18 years and on ART treatment between August 2006- September 2013.

Study population:

- PLWHA, age ≥18 years with a complete data from the ART follow-up in Fiche hospital from August 2006- September 2013.
Methods cont…. 

Inclusion criteria:
• HIV positive adults aged 18yrs or older who started ART with complete intake form, registers that have been in follow-up from 2006-2013.

Exclusion criteria
• Diagnosis is made outside of health institution (transfer in).
• Loss to follow up, or transfer out
• Women who were pregnant and lactating mother at the time of ART initiation
• Who do not have data about nutritional status before starting ART
Sample Size Determination:

- Formula for two population proportions based on the assumption that type I error 5%, power of 90% on exposure (malnourished on pre-ART treatment) and non-exposure (non-malnourished on pre-ART treatment) was taken from previous study (Paton NI et al., 2006).

\[
n_1 = \frac{\left[ Z_{\alpha/2} \sqrt{\left( 1 + \frac{1}{r} \right) P(1-P)} + Z_{\beta} \sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{r}} \right]^2}{(P_1 - P_2)^2}
\]

The sample size was 163 for \( n_1 \) (exposed group) and 326 for \( n_2 \) (non-exposed group), a total of 489 samples taken.
Sampling techniques

From August 2006 to September 2013 (n=3346)

- Transfer in=230
- Transfer out=959
- Lost to follow-up=51
- Age below 18 years=241
- Dropout=566
- Pregnant women=23
- Incomplete data=48

n=1228

Malnourished sample frame=388

n=163

N=489 selected using SRS

n=326

Non-malnourished sample frame=840

Figure 2: Profile of PLWHA enrolled on ART in Fiche Hospital, North Shoa, Ethiopia
Methods cont….

Independent variables:

- Socio demographic characteristics:
- Baseline clinical, laboratory and ART information:
- Functional status:

Dependent variable:

- The main outcome measure is time to mortality after initiation of ART
Methods cont....

Data collection methods and instruments

- A data collection tool was developed from ART follow-up form.
- The follow up documents was evaluated thoroughly.
- Six data collectors and one supervisor was recruited.
- The overall activities was monitored daily by the principal investigator of the study and supervisor.
- The most recent laboratory results before starting ART used as a baseline value.
Methods cont....

Data processing and analysis

• Data was **edited and coded** manually before data entry takes place.

• The data were entered into **Epi-Info Version 3.5.3** and then exported to **SPSS Version 16.0** and **STATA version 11** statistical packages.

• **Life table** - to estimate survival after initiation of ART

• **log rank test** - to compare KM survival curves b/n two groups

• **Cox proportional hazards model** - to determine independent determinants of time to death, to calculate bivariate and AHR
Methods cont....

Data quality control

- **Completeness and consistencies** of the questionnaire was checked.
- **Data cleaning and editing** were made before analysis.
- **Training**
- **Continuous supervision** and random check-up of the data collection.
- **Multivariate analysis**
Ethical Considerations:

- Ethical clearance was obtained from the Institutional Research Ethics Review Committee (IRERC) on the Harar campus of Haramaya University.
Methods cont....

**Operational Definitions:**

- **Survival time:** duration of time from first date of ART initiation until end point of outcome variable of interest in month.

- **Body mass index (BMI):** Weight in kilograms divided by height in meters squared.

- **Lost to follow up:** if a patient discontinued ART for at one to three month as recorded by ART physician

- **Functional Status:**
  
  Working: Able to perform usual work in or out of the house.  
  Ambulatory: Able to perform activities of daily living.  
  Bedridden: Not able to perform activities of daily living
Results and Discussions

Socio-demographic characteristics:

- The study involved a total of 489 adults on ART; 163(33.3%) were malnourished and 326(66.7%) were non-malnourished adults.
- Majority of the study subjects were females 254(51.9%)
- The mean(±SD) age at ART initiation was 34.36 ± 9.24yrs
- Unemployed patients accounts for 141(28.8%).
- Most of them 351(71.8%) followed Orthodox Christian.
- One hundred thirty eight (28.2%) had no formal education.
- Most of them 250(51.1%) were married.
Results and Discussions...

Baseline Clinical and laboratory characteristics

- The baseline mean (±SD) values for BMI of the participants was 19.75 ± 2.96.
- The median weight at ART initiation was 51 kg (IQR, 45 kg–57 kg).
- The median CD4 cell count at ART initiation was 145 cells/μl (IQR, 80-222).
- The median hemoglobin level was 12.90 g/dl (IQR, 10.9–14.6).
- Most of them were 220(45%) in WHO stage III and 197(40.3%) in WHO stage II.
- 197(40.3%) participants were ambulatory at baseline and 27(5.5%) were bedridden.
- 117(23.9%) had two and more previous opportunistic infections.
## Results and Discussion

Table 5: Baseline demographic and clinical characteristics and associated mortality among 489 patients on ART in Fiche Hospital, North Shoa Ethiopia.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total</th>
<th>Alive n=402</th>
<th>Death n=87</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%)</td>
<td>Number (%)</td>
<td>Number (%)</td>
<td></td>
</tr>
<tr>
<td><strong>Nutritional status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malnourished</td>
<td>163(33.3)</td>
<td>122(30.3)</td>
<td>41(47.1)</td>
<td>0.004</td>
</tr>
<tr>
<td>Non-malnourished</td>
<td>326(66.7)</td>
<td>280(69.7)</td>
<td>46(52.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>265(54.2)</td>
<td>257(63.9)</td>
<td>8(9.2)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ambulatory</td>
<td>197(40.3)</td>
<td>128(31.8)</td>
<td>69(79.3)</td>
<td></td>
</tr>
<tr>
<td>Bedridden</td>
<td>27(5.5)</td>
<td>17(4.2)</td>
<td>10(11.5)</td>
<td></td>
</tr>
<tr>
<td><strong>WHO clinical stage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage I</td>
<td>48(9.8)</td>
<td>47(11.7)</td>
<td>1(1.1)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Stage II</td>
<td>197(40.3)</td>
<td>192(47.8)</td>
<td>5(5.7)</td>
<td></td>
</tr>
<tr>
<td>Stage III</td>
<td>220(45)</td>
<td>149(37.1)</td>
<td>71(81.6)</td>
<td></td>
</tr>
<tr>
<td>Stage IV</td>
<td>24(4.9)</td>
<td>14(3.5)</td>
<td>10(11.5)</td>
<td></td>
</tr>
<tr>
<td><strong>CD4 count (cells/μl)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤200</td>
<td>335(68.5)</td>
<td>335(68.5)</td>
<td>260(64.7)</td>
<td>0.0001</td>
</tr>
<tr>
<td>&gt;200</td>
<td>154(31.5)</td>
<td>154(31.5)</td>
<td>142(35.3)</td>
<td></td>
</tr>
<tr>
<td><strong>previous OIs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>304(62.2)</td>
<td>289(71.9)</td>
<td>15(17.2)</td>
<td>0.0001</td>
</tr>
<tr>
<td>One</td>
<td>68(13.9)</td>
<td>50(12.4)</td>
<td>18(20.7)</td>
<td></td>
</tr>
<tr>
<td>&gt;2</td>
<td>117(23.9)</td>
<td>63(15.7)</td>
<td>54(62.1)</td>
<td></td>
</tr>
</tbody>
</table>
Result and Discussions...

Survival analysis:

- A total of 489 patients were followed for a median of 22 months.

- The overall estimated survival duration after ART initiation was 48 (95% CI=46.32 - 50.84) months.

- 87(17.8%) patients died during the study period giving a mortality rate of 5.63 per 100 person-year observations (87 deaths/1545.4 PYO).

This result was comparable with the study done in:

- Burkina Faso (5.4/100)............ _Armel Poda et al., 2013._
- Nepal (6.3/100)..................._Laxmi Bhatta et al., 2013._
However, this finding was lower compared to:

- Debre Markos (10.74/100)….. Nurilign Abebe et al., 2014
- Nigeria (11/100)……………… Solomon Odafe et al., 2012

This was higher compared to findings:

- Eastern Ethiopia (2.03/100)…… Sibhatu B. et al., 2012.
- Western Ethiopia (1.89/100)…… Mitiku T. et al., 2013.

These variations could depend on the characteristics of the patients, adherence, and quality of service provision.
Results and Discussions…

- Of the 87 deaths, 27(31%) occurred within the first three months of ART initiation and 41(47.1%) died in the first year of follow-up.

- Which was consistent with a study finding in:
  - Ethiopia (Debre markos)..... Nurilign Abebe et al., 2014
  - Meta analysis................. Gupta A. et al., 2011
  - Tanzania ....................... Johannessen A et al., 2008
  - Cameroon ....................... Sieleunou I et al., 2009
Results and Discussions…

This may partly be explained by the fact that:

- Majority of patients that 68.5% patients had advanced disease (CD4 count <200 cells/μl)

- 45% patients had advanced clinical symptoms (WHO clinical stage III) at the time of treatment initiation

- Might be due to delayed diagnosis and/or treatment.

- Stigma and discrimination related to HIV

- Limited availability and access to HIV testing and counseling (HTC) and ART services.
Results and Discussions…

Actuarial Life Table analysis showed that:

• The probability of survival time among malnourished adult ART patients was 79%, 91%, 93%, 94%, and 98% at 5, 10, 15, 20, and 30 months respectively.

• The probability of survival time among non-malnourished adults was 97%, 99%, 99% and 98% at 5, 10, 15 and 35 months respectively.

   The details are below
Table 6: Actuarial Life Table analysis of HIV-positive patients at ART initiation in Fiche Hospital, North Shoa, 2006-2013, \((N=489)\)

<table>
<thead>
<tr>
<th>Nutrition status</th>
<th>Interval start time</th>
<th>Number entered interval</th>
<th>Number of terminal events</th>
<th>Probability of terminating</th>
<th>Probability of surviving</th>
<th>Cumulative Probability of surviving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnourished</td>
<td>0</td>
<td>163</td>
<td>33</td>
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<td>.79</td>
<td>.79</td>
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<tr>
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<td>5</td>
<td>125</td>
<td>11</td>
<td>.09</td>
<td>.91</td>
<td>.72</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>110</td>
<td>7</td>
<td>.07</td>
<td>.93</td>
<td>.67</td>
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<tr>
<td></td>
<td>15</td>
<td>91</td>
<td>5</td>
<td>.06</td>
<td>.94</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>74</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>61</td>
<td>1</td>
<td>.02</td>
<td>.98</td>
<td>.62</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>51</td>
<td>3</td>
<td>.07</td>
<td>.93</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>33</td>
<td>3</td>
<td>.11</td>
<td>.89</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>17</td>
<td>2</td>
<td>.13</td>
<td>.87</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>12</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>5</td>
<td>1</td>
<td>.25</td>
<td>.75</td>
<td>.34</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>2</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.34</td>
</tr>
<tr>
<td>Nutrition status</td>
<td>Interval start time</td>
<td>Number entered interval</td>
<td>Number of terminal events</td>
<td>Probability of terminating</td>
<td>Probability of surviving</td>
<td>Cumulative Probability of surviving</td>
</tr>
<tr>
<td>------------------</td>
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<td>---------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Non malnourished</td>
<td>0</td>
<td>326</td>
<td>9</td>
<td>.03</td>
<td>.97</td>
<td>.97</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>313</td>
<td>4</td>
<td>.01</td>
<td>.99</td>
<td>.96</td>
</tr>
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<td></td>
<td>10</td>
<td>300</td>
<td>4</td>
<td>.01</td>
<td>.99</td>
<td>.95</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>272</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.95</td>
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<td>25</td>
<td>145</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>114</td>
<td>1</td>
<td>.01</td>
<td>.99</td>
<td>.93</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>77</td>
<td>1</td>
<td>.02</td>
<td>.98</td>
<td>.92</td>
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<td>40</td>
<td>45</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.92</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>29</td>
<td>0</td>
<td>.00</td>
<td>1.00</td>
<td>.92</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>16</td>
<td>1</td>
<td>.07</td>
<td>.93</td>
<td>.85</td>
</tr>
</tbody>
</table>
Figure 3: The plot of the overall estimate of Kaplan-Meier survival function of HIV patients treated with ART in Fiche hospital, North Shoa, 2006-2013.
Figure 4. Survival graph of HIV patients at ART initiation by nutritional status in Fiche hospital, North Shoa, 2006-2013.
Predictors of mortality

Table 10: Bivariate and Multivariate Cox-regression analysis of socio-demographic and baseline clinical characteristics of the cohort studied in Fiche Hospital, North Shoa during September 2006 to 2013. (N=489 patients)

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Number of deaths</th>
<th>Crude HR(95%CI)</th>
<th>Adjusted HR(95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Educational status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>36</td>
<td>1.86(0.73, 4.76)</td>
<td>1.35(0.50, 3.6)</td>
</tr>
<tr>
<td>Primary</td>
<td>26</td>
<td>1.60(0.63, 4.10)</td>
<td>2.05(0.78, 5.36)</td>
</tr>
<tr>
<td>Secondary</td>
<td>23</td>
<td>0.61(0.22, 1.71)</td>
<td>0.92(0.31, 2.74)</td>
</tr>
<tr>
<td>Tertiary</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Nutritional status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malnourished</td>
<td>41</td>
<td>7.58(4.63, 12.39)</td>
<td>5.40(3.03, 9.58)**</td>
</tr>
<tr>
<td>Non-malnourished</td>
<td>46</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ambulatory</td>
<td>69</td>
<td>4.91(2.91, 8.26)</td>
<td>3.84(2.19, 6.74)**</td>
</tr>
<tr>
<td>Bedridden</td>
<td>10</td>
<td>6.86(3.26, 14.44)</td>
<td>4.78(2.14, 10.65)**</td>
</tr>
<tr>
<td><strong>WHO clinical stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage I &amp; II</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stage III</td>
<td>71</td>
<td>3.1(1.89, 5.07)</td>
<td>2.21(1.16, 4.21)*</td>
</tr>
<tr>
<td>Stage IV</td>
<td>10</td>
<td>5.93(2.89, 12.17)</td>
<td>4.05(1.50, 10.97)**</td>
</tr>
</tbody>
</table>

NB. 1.00=Reference *=P-Value <0.05, **= P-Value ≤0.001
<table>
<thead>
<tr>
<th>Covariates</th>
<th>Number of deaths</th>
<th>Crude HR(95% CI)</th>
<th>Adjusted HR(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TB history</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>47</td>
<td>1.99(1.31, 3.05)</td>
<td>0.95(0.58, 1.55)</td>
</tr>
<tr>
<td>No</td>
<td>40</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>CD4 count (cells/μl)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤200</td>
<td>260</td>
<td>3.44(1.83, 6.48)</td>
<td><strong>2.95(1.48, 5.88)</strong>*</td>
</tr>
<tr>
<td>&gt;200</td>
<td>142</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Hemoglobin level (n=467)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10 g/dl</td>
<td>18</td>
<td>1.80(1.06, 3.04)</td>
<td>0.82(0.45, 1.51)</td>
</tr>
<tr>
<td>&gt;10 g/dl</td>
<td>62</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>previous OIs</strong></td>
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</tr>
<tr>
<td>None</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>18</td>
<td>1.80(0.99, 3.52)</td>
<td>1.31(0.69, 2.5)</td>
</tr>
<tr>
<td>2+</td>
<td>54</td>
<td>3.24(2.05, 5.13)</td>
<td><strong>2.30(1.11, 4.75)</strong>*</td>
</tr>
<tr>
<td><strong>HIV related counseling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>81</td>
<td>3.85(2.44, 6.08)</td>
<td>0.57(0.26, 1.24)</td>
</tr>
</tbody>
</table>

NB. 1.00=Reference *=P-Value <0.05, **= P-Value ≤0.001
Results and Discussions...

- This study revealed that a low baseline body mass index (BMI) at the start of ART was an independent predictor of mortality.

- This was in line with studies conducted in several sub-Saharan Africa (Degu Jerene et al., 2006, Lawn SD et al., 2009, Koethe JR and Heimburger, 2010, Paton NI et al., 2006, Liu E et al., 2011).

- This could be explained by:
  - Aggregate effects of malnutrition-induced immune system dysfunction
  - Higher burden of opportunistic infections
  - Metabolic derangement
  - Anthropometric variations
  - Side effects of certain antiretroviral drugs
Patients with advanced clinical diseases (WHO stage III or IV) had higher mortality compared to patients with WHO stage I or II.

This finding was supported by several other studies done in Ethiopia (Alemu AW and MS, 2010), Cameroon (Sieleunou I et al., 2009), Tanzania (Mageda K et al., 2012), and in other countries.

This might be due to the fact that patients died mostly because of their late initiation of ART when they had the worst health conditions.
Results and Discussions…

- Patients with two and above opportunistic infections were found to be significant predictors of death among patients under ART.

- This study established a similar finding with the studies in sub-Saharan Africa (Ketema, 2012, Lawn SD et al., 2008, Johannessen A et al., 2008).

- This might be due to the fact that individuals with protein-calorie malnutrition have an increased incidence and severity of life-threatening opportunistic infections.
Results and Discussions…

- Adult HIV-infected patients who were bedridden at ART initiation had higher risk of mortality compared to the patients with working functional status at treatment initiation.

- This result is in line with the study done in Eastern Ethiopia and those described elsewhere (Tegiste A and Eshetu W, 2012, Sibhatu B et al., 2012, L.Bhatta et al., 2013, Nurilign Abebe et al., 2014).

- May be due to late presentation of patient and concomitant disease.
Results and Discussions…

- Patients starting ART treatment with CD4 cell count \( \leq 200 \) cells/\( \mu l \) was an independent predictor of mortality in this study.

- This finding is consistent with a study by Sibhatu B. in Eastern Ethiopia (Sibhatu B et al., 2012) and Ketema in Addis Ababa (Ketema K and W, 2012) and other studies elsewhere (Mageda K et al., 2012 in Tanzania).

- This may be explained by:
  - Low CD4 cell count was associated with opportunistic infection thereby increasing the likelihood of death.
  - Majority of patients (75.5%) had a CD4 \( <200 \) cells/\( \mu l \), which could have made the comparison with higher CD4 counts statistically unstable.
Limitations of the study

- Selection bias.
- Underestimation.
- Inability to establish a direct causal relationship.
Conclusion

- High mortality occurred within 3 months of ART initiation.

- The mortality rate was 5.63 deaths per 100 person-years.

- The median survival time of malnourished adults was 35 months (95% CI: 30.39 – 39.61) and non-malnourished adults 52 months (95% CI: 50.23 – 54.21).

- The estimated mortality among malnourished adults was 21%, 28%, 33%, and 38% at 5, 10, 15, and 25 months respectively.
Recommendations

To hospitals and health centers with ART clinic

- Provision of nutritional support in conjunction with an early start of ART and strengthening the food by prescription initiative.

- Optimize prevention, screening and management of opportunistic infections.

- Patients being on ambulatory and bedridden functional status should be assessed for other possible concomitant disease conditions and treated with closer follow up so as to minimize the risk of death.
Recommendations

To Fiche town health office and other responsible organizations:

- In-service training should be given for the healthcare providers on HIV/AIDS care and support.
- Strong community education and mobilization on disseminating information on diet, nutrition, and health, particularly to PLWHAs.

To research and academic institutions:

- Prospective design to investigate the relationship between malnutrition and mortality in resource limited settings are recommended.
REFERENCES


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