A nutrition sensitive approach to delay the progression of HIV to AIDS among People Living with HIV (PLWH) in Nigeria

By

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Outline

• Introduction and rationale
• Aim and Objectives
• Method and Study design
• Results
• Outcomes (short – long terms)
• Future/on-going applications
• Conclusions
HIV/AIDS is a pandemic disease worsened by the presence of conditions such as under-nutrition and opportunistic infections (USAID, 2004; UNAIDS, 2008).
Introduction and Rationale

HIV ↔ Nutrition

Malnutrition → HIV
- Weakened immune system
- Increased susceptibility to OI
- Slower healing
- Poorer response to treatment
- Possibly more rapid disease progression

HIV → Malnutrition
- Reduced food intake
- Increased nutrient needs
- Altered nutrient absorption
- Altered nutrient metabolism
Undernutrition

Sub-Saharan Africa (SSA) remains the region most heavily affected by HIV/AIDS, accounting for 67% of all people living with HIV and for 75% of AIDS deaths in 2007 (USAID, 2004; UNAIDS, 2008).
<table>
<thead>
<tr>
<th>S/N</th>
<th>Rank of Country</th>
<th>People Living With HIV/AIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South Africa</td>
<td>6,070,800</td>
</tr>
<tr>
<td>2</td>
<td>Nigeria</td>
<td>3,436,600</td>
</tr>
<tr>
<td>3</td>
<td>India</td>
<td>2,085,000</td>
</tr>
<tr>
<td>4</td>
<td>Kenya</td>
<td>1,646,800</td>
</tr>
<tr>
<td>5</td>
<td>Mozambique</td>
<td>1,554,700</td>
</tr>
<tr>
<td>6</td>
<td>Uganda</td>
<td>1,549,200</td>
</tr>
<tr>
<td>7</td>
<td>Tanzania</td>
<td>1,472,400</td>
</tr>
<tr>
<td>8</td>
<td>Zimbabwe</td>
<td>1,368,100</td>
</tr>
<tr>
<td>9</td>
<td>United States of America</td>
<td>1,200,000</td>
</tr>
</tbody>
</table>
Vicious Cycle of Malnutrition and HIV
(Source: RCQHC and FANTA 2003)

- Poor nutrition resulting in weight loss, muscle wasting, weakness, nutrient deficiencies
- Increased nutritional needs, reduced food intake & increased loss of nutrients.
- Impaired immune system. Poor ability to fight HIV & other infections. Increased oxidative stress.
- Increased vulnerability to infections e.g. enteric infections, flu, TB hence increased HIV replication. Hastened disease progression. Increased morbidity.
## Effects of Malnutrition and HIV on the Immune System

### Malnutrition

- CD4 T-lymphocyte number
- CD8 T-lymphocyte number
- Delayed cutaneous hypersensitivity
- CD4/CD8 ratio
- Serologic response after immunizations
- Bacteria killing

### HIV

<table>
<thead>
<tr>
<th>Normal value/mm³</th>
<th>HIV value/mm³</th>
<th>AIDS value/mm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-1600</td>
<td>Vary*</td>
<td>Less than 200</td>
</tr>
</tbody>
</table>
Introduction and Rationale

• The revised recommendation for antiretroviral therapy (ART) will include an earlier start to treatment for all HIV-infected individuals with a CD4-cell count of 350/mm³ or less (WHO, 2010)

• Incidentally, all the HIV/AIDS interventions programmes at the moment focus on the remaining 25% of HIV infected subjects in Nigeria

• Presently, 75% of Nigerians infected with HIV do not require ART, but nutritional assistance to maintain the immune system
Number of PLWH who received ART against those who needed it

PLWH = People living with HIV
ART = Anti Retroviral Treatment

FMoH, 2007
WHO recommends that **nutritional care** and support with **macro/micronutrients** must be started at the **early stages** of the **infection** in order to prevent **weight loss** and **malnutrition** (Piwoz and Preble, 2000; WHO, 2009).
WHO recommends: Total Energy intake

• The Energy needs of symptomatic individuals are 20 to 30% in addition to normal intake per day.

• Asymptomatic HIV-positive individuals need 10% more energy (per day) than HIV-negative individuals of the same age and sex (Piwoz, 2004; FANTA, 2004, WHO/FAO, 2009).
Daily intake of tailored functional meal optimised to provide immune-boosting micronutrients from indigenous sources in Nigeria delays progression of HIV to AIDS by ameliorating the nutritional status \((\text{BMI, MUAC})\) and improving the biochemical indices \((\text{CD4 count, PCV, RG, SGOT, and TP})\) in People Living with HIV (with a CD4 count above 200 cells/mm\(^3\)).
Aim

To compare the long and short term effect of a nutrition sensitive approach to delay the progression of HIV to AIDS among People Living with HIV (PLWH) in Nigeria
Methods and Study Design

In summary
Step 1: Development of a functional meal
Step 2: Nutrition Intervention of optimised meal (short term versus long term)
Enrollment

Pilot
- Randomised (n=100)
  - Participants in pilot progressed to scale-up intervention. This group of participants was monitored for one year

Assessed for eligibility (n=1000)
- Excluded (n=600)
  - Not meeting inclusion criteria (n=350)
  - Declined to participate (n=50)
  - Other reasons (n=200): Distance study centre, access to other treatment protocol

Randomised (n=400)
- Achieved through computer generated numbers
- Allocated to Test and Control groups

Allocated to intervention (n=200)
- Received allocated intervention (n=100)
- Did not receive allocated intervention (give reasons) (n=100) Reason: Control

Follow-Up (3 & 6 months)
- Lost to follow-up (n=6) Reason: Absconded
  - Discontinued intervention (n=2) Reason: Travelled out of the study centre

Analysis (After 6 months)
- Analysed (n=192)
  - Excluded from analysis (n=6) Reason: incomplete data

Allocated to intervention (n=200)
- Received allocated intervention (n=100)
- Did not receive allocated intervention (n=100) Reason: Control

Follow-Up (3 & 6 months)
- Lost to follow-up (n=3) Reason: Absconded
  - Discontinued intervention (n=5) Reason: Travelled, redeployed out of Abuja, the study site

Analysis (After 6 months)
- Analysed (n=192)
  - Excluded from analysis (n=10) Reason: incomplete data
Step 1: Development of a functional meal

In West Africa, there are many macronutrients in commonly available food sources that may contain antioxidants and relevant essential vitamins and minerals. Such food sources need to be appropriately analyzed vis-a-vis their potentials for use in the management of HIV/AIDS.

Therefore, the focus of this public health nutrition intervention programme was to develop an optimized meal containing macro and micro nutrients from natural food sources in Nigeria employing the tailored food recipe (TFR*) concept.

This tailored meal will be optimized with the aim of improving the nutritional status and subsequently boosting the immune system of recruited participants. The benefit of this intervention is sustaining the 75% of PLWH in Nigeria who do not require ART at a CD4 count level (i.e. CD4 ≥350 cells/mm³) that will not require initiation of ART and also maintaining the CD4 count of PLWH in Nigeria who are on ART at ≥200 cells/mm³.
*Tailored Food Recipe - TFR:

Food that is naturally occurring, accessible, affordable and perhaps consumed in unusual concentrations as part of the usual diet and demonstrate physiological and or biomedical benefits in reducing the risk of chronic disease beyond basic nutritional functions (Amlogu et al, 2012; 2013 and 2014).
TFR Ingredients (all are locally produced and readily available)

Moringa  Soya bean  Millet  Carrot

Sundried, roasted, powdered ingredients

Mixed percentage to produce the intervention meal

TFR = Amtewa (100gm)

Ready for sensory evaluation
Sensory Evaluation Test
Packed intervention meal; ‘Amtewa’
Step 2: Nutrition Intervention of optimised Amtewa meal
Design of the study (12 months)

**ART enrolment (Symptomatic)**
- CD4 ≥ 200/mm³
- Randomization
- Amtewa + HAART
- N = 25 participants
  1. Nutrition counseling
  2. Vitamin supplement & HAART
  3. Amtewa meal

**Pre-Art enrolment (Asymptomatic)**
- CD4 ≥ 350/mm³
- Randomization
- Amtewa
- N = 25 participants
  1. Nutrition counseling
  2. Vitamin supplement
  3. Amtewa meal

Control
- N = 25 participants
  1. Nutrition counseling
  2. Vitamin supplement & HAART

Control
- N = 25 participants
  1. Nutrition counseling
  2. Vitamin supplement

**Figure 2.** Illustrating the two arms of study design (Symptomatic vs Asymptomatic) and showing the patients on Amtewa meal, Amtewa + HAART versus their controls.
Briefing and recruiting participants
Briefing the very 1st participant before taking her anthropometric measurements (MUAC, BMI) followed by blood tests (CD4)
Results
Figure 3. Bar chart showing the impact of Amtewa meal on MUAC (cm) of study patients (n = 100).
Figure 4. Bar chart showing the impact of Amtewa meal on CD4 (count cell/mm³) of study patients (n = 100).
Percentage increase in participants’ CD4 Count and MUAC over twelve (12) months period (n=100)
### Percentage increase/decrease (n=100)

<table>
<thead>
<tr>
<th>Months</th>
<th>Pre-ART MUAC</th>
<th>ART MUAC</th>
<th>Pre-ART CD4 count cells</th>
<th>ART CD4 count cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>1.59</td>
<td>1.97</td>
<td>-0.23</td>
<td>6.11</td>
</tr>
<tr>
<td>6</td>
<td>3.25</td>
<td>5.58</td>
<td>0.69</td>
<td>9.10</td>
</tr>
<tr>
<td>9</td>
<td>0.69</td>
<td>4.02</td>
<td>-1.70</td>
<td>8.43</td>
</tr>
<tr>
<td>12</td>
<td>2.08</td>
<td>3.95</td>
<td>2.21</td>
<td>12.14</td>
</tr>
</tbody>
</table>
Outcomes

- Data on the impact of macro and micronutrients on the progression of HIV to AIDS (short versus long term).
- Meeting the daily requirements of some essential minerals and vitamins (selenium, zinc, iron etc and vitamins - A, B, C, D, and E).
- Achieving and maintaining an ideal body weight
- Decreasing functional impairment from under-nutrition (muscular fatigue, bedridden state and work incapacity)
- Improving immune function
- Improved quality of life
Potential future applications of TFR

- TFR for the delay of cancer Cachexia to refractory Cachexia
- TFR for ADHD and Autistic children (FORD: Fish oil rich diet)
- TFR for children with low IQ
- TFR to prevent DM complications
- TFR to prevent Osteoporosis

Attention Deficit Hyperactivity Disorder = ADHD
The gained result suggests that a prolong consumption of the intervention meal (Amtewa) will be cost effective and suitable to sustain the gained improvements in the anthropometric and biochemical indices.

Prolong longevity, improve quality of life of and retention at workplace of PLWHIV

Overall, it underpins the synergistic relationship between nutrition and HIV infection, the nutritional requirement and nutritional care and support for PLWH in Nigeria.
Publications based on this study


Potential future/ongoing applications of TFR

- TFR for the delay of cancer cachexia to refractory cachexia
- TFR for ADHD and Autistic children (FORD: Fish oil rich diet)
- TFR for children with low IQ
- TFR to prevent DM complications
- TFR to prevent Osteoporosis

Attention Deficit Hyperactivity Disorder = ADHD

Thank you for listening.