Association of Vitamin D Deficiency with Lipoatrophy Amongst HIV-Positive Patients in Windsor, Ontario

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Background

- Vitamin D deficiency is reported in the general population in groups such as non-whites, northern dwellers, as well as in the elderly.
Presented at the 1st Int. workshop on HIV & Aging, 4 – 5 Oct. 2010, Baltimore, USA
Lower vitamin D in the elderly is potentially due to lipoatrophy of aging.*


Vitamin D deficiency in HIV

• High prevalence of severe vitamin D deficiency in combined antiretroviral therapy-naive and successfully treated Swiss HIV patients. Mueller NJ, Fux CA, et al. Swiss HIV Cohort Study. AIDS. 2010 May

• High frequency of vitamin D deficiency in ambulatory HIV-Positive patients. Rodríguez M, Daniels B, et al. AIDS Res Hum Retroviruses. 2009 Jan

• Vitamin D deficiency among HIV type 1-infected individuals in the Netherlands: effects of antiretroviral therapy. Van Den Bout-Van Den Beukel CJ, Fievez L, AIDS Res Hum Retr. 2008 Nov


• Highly prevalent vitamin D deficiency and insufficiency in an urban cohort of HIV-infected men under care. Wasserman P, Rubin DS. AIDS Patient Care STDS. 2010 Apr


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Vitamin D deficiency in HIV

- Vitamin D deficiency is common amongst HIV-positive patients, and may affect bone metabolism and other aspects of aging.
Hypothesis

- Since sunlight-associated vitamin D is synthesized in skin
- Atrophic skin changes have been reported as a potential cause for deficiency in the older population

We hypothesized that lipoatrophy may affect vitamin D levels and contribute to Vitamin D deficiency in the HIV population.
Methods

Design:
Retrospective chart review of the entire HIV Care Program database in Windsor, Ontario

- Age
- race
- month
- exposure to or current use of
  - Zidovudine
  - Stavudine
  - Efavirenz
  - Protease inhibitors
- CD4 nadir
- current VL and CD4
- BMI
- lipoatrophy
- current smoking status
- 25-OH Vitamin D
Statistical Methods

- We examined vitamin D levels
  - log-transformed continuous measure
  - multiple linear regression
  - backward selection of variables
- We examined vitamin D deficiency
  - levels <50 nmol/L
  - multivariable logistic regression
- SPSS version 18
- p < 0.05
# Results: Patient Characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of patients</strong></td>
<td>217/235 (92%)*</td>
</tr>
<tr>
<td><strong>Average Age (SD), yrs</strong></td>
<td>45.5 (11.2)</td>
</tr>
</tbody>
</table>
| **Race**                 | 76% white  
                         | 24% non-white |
| **Gender**               | 22% female  
                         | 78% male |
| **Average BMI (SD)**     | 26.4 (4.7) |
| **Lipoatrophy**          | 69 (33%) |
| **Current smokers**      | 108 (50%) |

* patients were excluded if there was any incomplete data

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## Results: HIV Disease and Treatment Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median CD4 nadir (min-max)</td>
<td>163 cells (1-568)</td>
</tr>
<tr>
<td>VL &lt;50</td>
<td>172 (79%)</td>
</tr>
<tr>
<td>Exposure to AZT or d4T</td>
<td>136 (63%)</td>
</tr>
<tr>
<td>Current EFV</td>
<td>90 (42%)</td>
</tr>
<tr>
<td>Current PI</td>
<td>71 (33%)</td>
</tr>
</tbody>
</table>
Results: Vitamin D*

*Vitamin D levels defined as sufficient = >75nmol/L; insufficient or low = 50-75nmol/L; deficient = <50nmol/L

Mean (SD) = 69 nmol/l (32)  33% <50nmol/L  65% <75nmol/l
## Vitamin D Level
Multiple Linear Regression Model (adjusted)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta-coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipoatrophy</td>
<td>-0.063</td>
<td>0.035</td>
</tr>
<tr>
<td>Age&lt;50</td>
<td>-0.056</td>
<td>0.037</td>
</tr>
<tr>
<td>Non-white</td>
<td>-0.182</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nov_April</td>
<td>-0.086</td>
<td>0.001</td>
</tr>
<tr>
<td>EFV_current</td>
<td>-0.061</td>
<td>0.005</td>
</tr>
<tr>
<td>AZT or d4T (ever)</td>
<td>-0.059</td>
<td>0.041</td>
</tr>
</tbody>
</table>

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### Vitamin D Deficiency (<50 nmol/L)  
Multiple Logistic Regression Model (adjusted)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipoatrophy</td>
<td>3.5 (1.7, 7.2)</td>
<td>0.001</td>
</tr>
<tr>
<td>Non-white</td>
<td>7.5 (3.4, 16.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nov_April</td>
<td>2.9 (1.5, 5.7)</td>
<td>0.002</td>
</tr>
<tr>
<td>EFV_current</td>
<td>2.0 (1.0, 3.8)</td>
<td>0.044</td>
</tr>
</tbody>
</table>
Limitations

- Small cross-sectional study
- Clinical assessment of lipoatrophy
- Seasonal variation of vitamin D levels
Conclusions

- Lipoatrophy or a history of exposure to the thymidine analogues AZT and d4T were associated with lower vitamin D blood levels, and with vitamin D deficiency.

- These data suggest that skin synthesis of vitamin D may be affected by previous antiretroviral exposure, and identifies a group of patients who require screening.
These data may also suggest that in HIV patients who have lipoatrophy, sun exposure may not be enough to maintain adequate levels of Vitamin D and that these patients should be counseled with respect to food and supplement intake of Vitamin D.