CHAPTER 5

DISSCUSSIONS AND CONCLUSIONS

This study examined serum micronutrients status including vitamin A, E, B12, zinc and selenium in HIV-infected patients treated with GPO-vir and healthy subjects. The characteristic of studied subjects showed that BMI was significant lower in HIV-infected subjects than healthy subjects. There was significant difference in average time of using GPO-vir between HIV group with CD4+ T cell counts < 200 and ≥ 200 cells/mm^3. There were significant difference of the proportion of education, income status and alcohol drinking status between HIV-infected and healthy subjects.

Vitamin A status

The results showed that the prevalence of vitamin A deficiency (1.7%) in HIV-infected subjects was less than in published reports from the pre-treatment with HAART such as Beach et al reported that 11 % of vitamin A deficiency was found in the USA and 39% in Africa [(75)]. In addition, mean of vitamin A was not significantly difference between HIV-infected and healthy subjects. This result was consistent with report of from Tang et al [(78)] that serum vitamin A levels were not significantly difference between HIV-negative and HIV-positive injecting drug users (0.37 vs. 0.38 ug/mL). The mean of serum vitamin A concentration in these HIV-infected subjects similar to the mean of vitamin A concentration of Thai healthy people in Bangkok [(68)]. However, serum vitamin A concentration in HIV group with CD4+ T cell counts < 200 cells/mm^3 higher than in HIV group with CD4+ T cell counts ≥ 200 cells/mm^3.

These results were consistent with report of from Jones et al. [79] that women in the upper quartile of serum vitamin A had higher viral load than those in the lowest quartile. Randomized trials has been found that vitamin A supplement increases the risk of mother-to-child transmission because of vitamin A is known to increase lymphoid cell differentiation, which lead to an increase in CCR5 receptors for attachment of HIV virus.

Vitamin E status

Mean of serum vitamin E was not significant difference between HIV-infected and healthy subjects and also similar results were observed in HIV groups with CD4+ T cell counts < 200 and ≥ 200 cells/mm^3. These results were in good agreement of from Jone et al. [79]. Tang et al. [78] reported that there were no significantly differences of vitamin E concentration between categories of CD4+ T cell counts (< 200, 200-499 and ≥ 500 cells/μL) among the HIV-positive subjects with taking antiretroviral drug. HAART treatment may reduce oxidative stress and decreasing of chronic inflammation and opportunistic infection. However, the percentage of vitamin E deficiency in HIV-infected subjects was significant higher than the healthy subjects (21.1% vs. 8.3%). The prevalence of vitamin E deficiency in this HIV-infected subjects seemed to higher than HIV-infected patient on HAART in the USA (7% for males and 0% for females) [79]. A principal reason for this finding may explain that the HIV infection may increases vitamin E requirements. For example, studies in both humans and animal model showed that vitamin E supplementation, in approximately 2 to 10 fold excess of the recommendations, significantly increase humeral and cell-mediated immune which response to antigens and enhances phagocyte functions. In

addition, Junior et al. [83] conclude that 800 mg/day of α - tocopherol supplementation provided an increase in the viability of peripheral blood lymphocytes in HIV positive patients who received antiretroviral therapy.

Vitamin B12 status

There was no significantly difference of mean serum vitamin B12 concentration between HIV-infected and healthy subjects and between HIV patients group with CD4+ T cell counts < 200 and ≥ 200 cells/mm^3. The prevalence of vitamin B12 deficiency was only 3.3% of HIV-infected subjects and none of the subjects were found in the healthy subjects. Remacha et al. [21] demonstrated that the prevalence of vitamin B12 deficiency was significantly lower in patients with receiving HAART than patients with did not receive HAART (8.7% & 28%, respectively). In addition, Hepburn et al.[81] showed that vitamin B12 concentrations increased significantly after initiating antiretroviral (416 and 535 pg/mL, p = 0.04). In this study, serum vitamin B12 concentration was not measured in HIV-infected patient before receiving HAART (GPO-vir).

Zinc status

Mean serum zinc concentration was not difference between HIV-infected and healthy subjects and also the group with CD4+ T cell counts < and ≥ 200 cells/mm^3. These results are consistent with report of from Rousseau et al. [19] that showed no significant difference in serum zinc concentration between patients with CD4+ T cell counts > 250/mm^3 and < 250/mm^3. In addition, Mocchegiani et al. [20] reported that HIV-infected adults treated with HAART showed significantly increased plasma zinc

concentrations (the mean concentration increased from 0.78 to 0.96 μg/mL) and increased CD4+ T cell counts over a 4 month period without zinc supplementation. However, in this study, there was high prevalence of zinc deficiency in both HIV-infected and healthy subjects (17% vs. 23%). The percentage of deficiency was higher in group with CD4+ T cell counts < 200 than in group with CD4+ T cell counts ≥ 200 cells/mm^3 (20% vs. 14.5%). The high prevalence of serum zinc deficiency in this study was similar to previous report such as Rousseau et al. [19] reported that after treated with HAART for 3 years, 27% of HIV-infected patients were found to have zinc deficiency. Jones et al. [79] showed that 40% and 36% of HIV patients' male and female respectively who were treated with HAART had serum zinc deficiency. Zinc deficiency has been associated with chronic diarrhea. Although, our HIV-infected subjects had few active infections. However, this study had no information about diarrhea and the occurrence of infectious disease episode.

Selenium status

There was no significant difference in mean concentration of serum selenium and the percentage deficiency between HIV-infected and healthy subjects. It seemed that the mean of serum selenium in these subjects was not different from serum selenium in HIV-infected Thai patients in Bangkok [13]. The prevalence of serum selenium deficiency in this study was much, less than in published report from the pre-HAART in France (77% prevalence of serum selenium deficiency) [19]. In addition, there was no difference in mean serum selenium between patients with CD4+ T cell counts < 200 cells/mm^3 and patients group with CD4+ T cell count ≥ 200 cells/mm^3. This result was consistent with report of from Rousseau et al. [19]

showed no significant difference in serum selenium concentration between patients with CD4+ T cell counts >250 cells/mm^3 and CD4+ T cell counts < 250 cells/mm^3 after receiving HAART for 3 years. Jones et al. [79] also found no association of selenium and CD4+ T cell counts. One explanation is that higher viral replication results in lower selenium concentrations because of viral utilization and sequestration of selenium in HIV selenoproteins [88]. Batterham et al. [89] found that viral load tended to correlate negatively with GPX and serum selenium. It is possible that HIV viruses were suppressed with HAART resulting to improve selenium levels.

Influence of BMI, education, income status and alcohol consumption on micronutrients status of HIV-infected and healthy subjects

There were no significantly difference in mean of all micronutrients between HIV-infected and healthy subjects in all categories of significance variable (BMI, education, income status and alcohol consumption).

Influence of frequency of food intake

Food intake might influence serum micronutrient level. Therefore, we collected food frequency data recall 7 days. However, there were no significantly difference for vitamin A, E, B12 and selenium between HIV-infected and healthy subjects and HIV group with CD4+ T cell count < 200 and ≥ 200 cells/mm^3. Although, mean intake of zinc was significantly lower in HIV-infected subjects than that in healthy subjects. However, this assessment of dietary intake has limitations which it can not indicate the quantity of received each micronutrient. In addition, list of food source in the questionnaire may not cover all items of food consumption of the subjects.

Conclusions

The current study supported the conclusion that most of HIV-infected patients had mean of all micronutrient concentration within normal range. There were no significant differences in mean of all micronutrient compared to the healthy controls. The percentage of vitamin E and zinc deficiency were higher in both HIV and in the healthy group. Therefore, supplementation of these micronutrients to Thai population may help improve their nutritional status.

Further study

Additional research is required to determine the importance of micronutrients and the safety of micronutrients dose in HIV infection. Although HAART can suppress viral load, decrease risk of opportunistic infection, immune reconstitution as shown by increase in CD4+ T cell counts. However, not all patients have an optimal response to therapy which viral may not be well controlled because of poor drug adherence or other factors leading to the development of drug resistance. Some patients, even when viral replication was controlled, had slow and incomplete recovery of immune function [(90)]. It is possible that malnutrition may impair the immune response to HAART. In addition, adverse of nucleoside analog reverse transcriptase inhibitor (NRTI) such as stavudine contain of GPO-vir antiretroviral drug, which was an agent inhibit HIV replication and can also inhibit the human DNA polymerase γ lead to depletion of mitochondrial DNA and drug toxicity [(91)]. As about 85-90% of oxygen is utilized by mitochondria; effect of mitochondrial dysfunction is an increase generation of free radical and oxidative damage [(92)]. However,

mitochondrial dysfunction could be improved by antioxidant supplementation [90]. Therefore, suitable nutrition status remains important in HIV/AIDS population.