Nutritional status improvement of child with HIV-1 infection within 12 months highly active antiretroviral therapy in Sanglah Hospital Denpasar

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ABSTRACT

Growth failure is a common feature of children with HIV-1 infection. Clinical efficacy of highly active antiretroviral therapy (HAART) in children has been well documented in developed countries, but only few data from developing countries. Highly active antiretroviral therapy shows improvement clinical outcome, immune status, growth parameters in HIV infected children, therefore, decrease morbidity, death and improve quality of life children infected with HIV. The objective of this study was to determine nutritional status improvement of child with HIV-1 infection in 12 months HAART in Sanglah Hospital Denpasar. A retrospective cohort study was conducted at Allergy-Immunology Division/Department of Child Health, Udayana University Medical School/Sanglah Hospital Denpasar in July 2013. The growth differences before and after HAART was analyzed by paired t-test using SPSS program. A total of 31 children were analyzed. Generally, rerata parameters of nutritional status were increased at any period of measurement. Changes of nutritional status is seen by comparing the nutritional status parameters within a period of 3 months up to 12 months of observation. There were increasing in the mean of weight/age (W/A) from baseline (-2.30) to 12 weeks (-1.61) (mean difference 0.69; 95% CI 0.37 to 1.00; P<0.001), from 12 weeks (-1.61) to 24 weeks (-1.34) (mean difference 0.27; 95% CI 0.09 to 0.45; P=0.003), from 24 weeks (-1.34) to 36 weeks (-1.09) (mean difference 0.52; 95% CI 0.45 to 0.70; P=0.001) and from 36 weeks (-1.09) to 48 weeks (-1.02) (mean difference 0.07; 95% CI -0.07 to 0.20; P=0.351). The mean of height/age (H/A) were also increasing from baseline (-2.30) to 12 weeks (-1.61) (mean difference 0.69; 95% CI 0.37 to 1.00; P<0.001), from 12 weeks (-1.61) to 24 weeks (-1.34) (mean difference 0.27; 95% CI 0.09 to 0.45; P=0.003), from 24 weeks (-1.34) to 36 weeks (-1.09) (mean difference 0.52; 95% CI 0.45 to 0.70; P=0.001) and from 36 weeks (-1.09) to 48 weeks (-1.02) (mean difference 0.07; 95% CI -0.07 to 0.20; P=0.351). The mean of height/age (H/A) were also increasing from baseline (-2.85) to 12 weeks (-2.60) (mean difference 0.25; 95% CI 0.01 to 0.50; P=0.049), from 12 weeks (-2.60) to 24 weeks (-2.22) (mean difference 0.38; 95% CI 0.01 to 0.76; P=0.047), from 24 weeks (-2.22) to 36 weeks (-1.76) (mean difference 0.46; 95% CI 0.15 to 0.77; P<0.001), but from 36 weeks (-1.76) to 48 weeks (-1.84) were decreasing (mean difference -0.08; 95% CI -0.31 to 0.14; P<0.001). It can be concluded that HAART has a positive effect on children's growth in 12 months of observation in the form of an increase in generally W/A and H/A from time to time.

Keywords: nutritional status, HAART, HIV-1 infected children

INTRODUCTION

Incidence of human immunodeficiency virus (HIV) in children is increasing in line with the increase in adults’ cases. Data from the World Health Organization (WHO), obtained that 4.4 million children infected with HIV are spread around the world and led to the death of 3.2 millions of children. During the last 20 years, a global impact of HIV epidemic in children throughout the world is very worrying. Based on it HIV is the cause of significant morbidity and mortality in children.1,2

Growth failure has been recognized as a complication of HIV infection in children, which can be presented as stunting, lost weight, failed to grow and severe acute malnutrition with bad response to rehabilitation. The mechanism of growth failure is complex and can be caused by various factors, including inadequate calory intake, an opportunistic infection and enteropathy HIV. Abnormal resting energy expenditure, abnormal function of thyroid gland, fat metabolism and endocrine abnormalities can also contribute to growth failure in HIV infected children.3-7

Clinical efficacy of highly active antiretroviral therapy (HAART) in children has been well documented in developed countries, but only few data from developing countries. Highly Active Antiretroviral Therapy shows improvement clinical outcome, immune status, growth parameters in HIV infected children, therefore, decrease morbidity, death and improve quality of life children infected with HIV. A recent study reported good growth failure due to HIV infection in children, which can be presented as stunting, lost weight, failed to grow and severe acute malnutrition with bad response to rehabilitation. The mechanism of growth failure is complex and can be caused by various factors, including inadequate calory intake, an opportunistic infection and enteropathy HIV. Abnormal resting energy expenditure, abnormal function of thyroid gland, fat metabolism and endocrine abnormalities can also contribute to growth failure in HIV infected children.3-7

Clinical efficacy of highly active antiretroviral therapy (HAART) in children has been well documented in developed countries, but only few data from developing countries. Highly Active Antiretroviral Therapy shows improvement clinical outcome, immune status, growth parameters in HIV infected children, therefore, decrease morbidity, death and improve quality of life children infected with HIV. A recent study reported good response on growth of children who gets HAART in sub-Saharan Africa, include significant improvement of weight and height. Early evidence on HIV child has shown that combination of antiretroviral therapy has positive effects on an average weight, height, rapidity of growth and appetite. However, in contrast to several other researches obtained the result of being diverse to the growth of the child who got HAART. Differences in weight and immune response to HAART is based on age when starting, the degree of suppression virus, the presence of opportunistic infections or anemia.8-12

Therefore, we want to see how the growth of children with HIV-1 infection who gets HAART at our place, and see if there are any differences between W/A, H/A and BMI/A from time to time in the 12 months since HAART begins.

METHODS

The design of this study was a retrospective cohort conducted at Allergy-Immunology Division/Department of Child Health, Udayana University Medical School/Sanglah Hospital Denpasar in July 2013. The population of this research are HIV children who underwent antiretroviral therapy minimum within 12 months at Sanglah Hospital of Denpasar. The sample size was determined by the formula to test the hypothesis on the mean of pairing population. The standard deviation of different mean (from the previous study), at 95% CI (α = 0.05), then Zα = 1.96. The power of study is 80% (β = 0.2), then Zβ = 0.84. The minimum mean difference which is considered significant (from previous study). Based on the above formula, the minimum sample obtained was 26 persons. Sample were collected through consecutive sampling, namely, every patient who meets the criteria will be selected as sample, until the amount reaches the required sample. The data were taken from medical records which included body weight, height or body length, collected at the beginning of the HAART, and after 12, 24, 36, 48 weeks of medication. Total CD4 and clinical stadium were also collected at the beginning of the HAART. The data were collected every 3 months or at least 2 weeks before or after the 3 months. The patients who did not come within 2 weeks prior and after the data collection are excluded. HAART consisted of first line regimen with two nucleoside reverse transcriptase inhibitor (NRTI) and one non nucleoside reverse transcriptase inhibitor (NNRTI). Zidovudin (AZT) was given with the dosage ranges 180–240 mg/m², lamivudin (3TC) was given with the dosage 4 mg/kg of body weight and nevirapin (NVP) was given with the dosage ranges 120–200 mg/m². Highly active antiretroviral therapy was given twice a day every 12 hours. The study protocol was approved by the medical ethics committee of Sanglah Hospital.

The nutritional status of the subject was determined using WHO 2005 with body weight/age, body height/age or body length/age and body mass index (BMI)/age as the indicator of the growth. The measurement included body weight, height or body length. The body weight was measured by the scale with accuracy of 0.1 kg. The patient was weighed in standing position in minimum cloth; in case a child cannot stand, the baby sitter holds the child and both are weighed. The body weight of the child will be attained by reducting the total weight with body weight of the baby sitter. The body length was measured with accuracy of 0.1 centimetre using body length measuring board. The body height was measured by using microtoise with the accuracy of 0.1 centimetres without footwear in body straight position. The growth was observed from the commencement of the medication until the 48th week, and then average score is taken.

The data obtained were presented in narrative and table form; the basic characteristic of the subject was presented in mean, deviation standard
and percentage. The difference of growth before and after HAART is analyzed using paired t-test with SPSS application.

RESULTS

Subject characteristics
Subjects of this study were thirty-one children which consists of 15 boys (48.4%) and 16 girls (51.6%). The average age of the subject was 3 years, with an initial time of nutritional status based on WHO 2005 is W/A -2.30 (1.65), H/A -2.85 (1.23), BMI/A -0.70 (1.70) (Table 1).

Child Growth
The indicator to assess growth is conducted by using WHO 2005 which includes body weight/age, body height/age or body length/age and BMI/age. The mean of the nutritional status of the subject in each assessment period can be seen in Table 2. In general, it seems that the mean of nutritional status parameter shows improvement in each assessment period. The changes of nutritional status are seen by comparing nutritional status parameter within 3 month period to 12 month observation (Table 3). It was shown that the nutritional status of body weight/age generally improves significantly in term of statistic, except within last 3 month period, the improvement is insignificant. The nutritional status of body height/age in general improves significantly, except within last 3 month period, there is a significant decrease. The nutritional status of BMI/Age in quarter I and IV seems improve, while in quarter II and III seems decrease but the changes were not significant.

Figure 1 shows probability comparison between 3 groups of nutritional status based on W/A in the achievements of normal nutritional status. It seemed that at baseline for normal nutritional status, the probability is 100% then up to three months there are 16.7% decrease to underweight but afterwards all be normal. At baseline for underweight subject looked all the children with the underweight status, after three months therapy there are 44.4% being normal, on six months therapy increase to 55.6%, on 9 months therapy settle, and at 12 months therapy increase again 77.8% child who is normal. At baseline for severely underweight, after 3 months of therapy there is a 20% being normal, on a 6 month therapy is increased to 50%, in the 9 months of therapy is increased to 80%, and at 12 months of therapy seemed settled. It can be concluded on Kaplan-Meier curves based on the parameters of nutritional status W/A seems to have increased.
achievement of normal nutritional status during HAART.

DISCUSSION

The results of this study showed children with HIV-1 infection showed an increasing trend on weight and height. Weight/Age z score increased from -2.30 in the early to -1.61, -1.34, -1.09, -1.02 in a row on a 3 months, 6 months, 9 months and 12 months of observation. Height/Age z score increased from -2.85 in the early to -2.60, -2.22, -1.76, -1.84 in a row on a 3 months, 6 months, 9 months and 12 months of observation. These changes in general increased significantly. Difference on BMI, BMI/A z score in the early -0.70, to 0.18, 0.12, 0.10, 0.27 in a row on a 3 months, 6 months, 9 months and 12 months of observation where such change is not significant. Kaplan-Meier curve showed an increase in the probability of a child in achieving normal nutritional status based on initial nutritional status as a group therapy.

Results of this study were in accordance with the results of previous study. In a study conducted in Ugandan, Africa, showed increased body weight and height for 48 weeks of HAART. In a multicentre study also showed an increase in z score W/A and H/A after 96 weeks of HAART but not for BMI/A. In contrast to the increase of the BMI in adults on HAART, BMI did not increase in all children effectively treated with HAART. Body mass index increased more in children with an advanced stage of infection and a poor nutritional status at baseline. Other study was conducted among 173 HIV-1-infected children initiating HAART at an HIV treatment clinic in Kenya, found that following HAART initiation, younger children had more rapid catch-up to the population-average weight of their peers than older children, demonstrating growth benefit of earlier HAART. Study in South Africa found that weight gain in HIV infected children was increased after 24 weeks of HAART, and the weight gain response after HAART can be a prognostic factor due to mortality. Preliminary evidence in pediatric HIV suggests that combination antiretroviral therapies have a positive effect on mean weight, height, growth velocity, appetite and well being. Improving in height is often appreciated after the improvements of weight. The mechanism of change of growth during HAART until now is still unclear. Chronic viral activity is likely to alter growth patterns for any child. Thus, inducing viral suppression may potentially shunt energy utilization from a chronic immunologically activated state to positive nitrogen balance, with improved gain in both weight and height. Other studies are required to determine whether the factors that play a role in the failure of growth of children infected with HIV-1 before HAART like calorie intake, growth and thyroid hormones, lipids metabolism and resting energy expenditure also play a role in the improvement of growth during HAART.

Some limitations on this study were small number of samples, short observation, and we did not take into account confounding variables such as the viral load, opportunistic infection and anemia at initiation.

CONCLUSION

Highly active antiretroviral therapy has a positive effect on children's growth in 12 months of observation in the form of improved W/A and H/A from time to time. Further study is required to see whether this effect will last as long as HAART treatment.

REFERENCES


