Original Article

Family nutritional support improves survival, immune restoration and adherence in HIV patients receiving ART in developing country

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In developing countries, access to antiretroviral treatment for persons living with HIV is still in progress. Malnutrition represents another cause of acquired immunodeficiency and premature death. This evaluation program estimated the impact of family nutritional support during the first year of antiretroviral treatment in West Africa's sub-Sahara region. Family nutritional support was proposed to patients with CD-4 cell count <200 /mm^3 and/or developing a WHO stage III/IV or with body mass index <18.5 kg/m² and receiving antiretroviral treatment. Follow-up of 62 patients receiving support was compared to 118 patients who had only received antiretroviral treatment the year before. Average body mass index, CD-4 cell count were 20.7 and 20.5, 217 and 191/mm^3 respectively in supported and control groups (NS). Twenty-two (36%) and 56 (48%) were WHO stage III/IV (NS) respectively in supported and control groups. One patient who received support and twelve controls died (Mortality Ratio=0.19; p<0.05). Increase in CD-4 cell count was around 1.7 times higher (+ 114 vs. + 68 CD-4 cells/mm^3 respectively in supported and control groups; p<0.05) and observance was improved in supported group (p<0.005). The evolutions of WHO stage and body mass index were not different but the study period was short. Family nutritional support for persons living with HIV initiating antiretroviral treatment in a developing country showed a positive impact after six months. This family intervention could be integrated into AIDS interventions as an effective and comprehensive community-based primary care.

Key Words: AIDS, developing country, nutritional support, survival, immunologic restoration

INTRODUCTION

Antiretroviral therapy (ART) and opportunistic infections (OI) prophylaxis have become the cornerstone of the therapeutic arsenal available against HIV infection worldwide.[1] In developing countries, although providing affordable access to ART for people living with HIV (PLWH) is one of the highest global public health priorities, it clearly needs to be combined with clinical care to get patients living longer and better quality of lives.[2,3] In spite of certain advantages brought by the large-scale distribution of triple combination of ART, patients starting ART in resource-poor settings have increased mortality rates in the first months on therapy compared to those in developed countries because of late diagnosis and evolved stage of the disease.[4]

In 14 countries of sub-Saharan Africa, 35 % of the population suffered from chronic malnutrition in 2001-2003.[5] Chronic malnutrition is still a major contributor to the burden of HIV disease worldwide and high AIDS prevalence is a major determinant in maintaining situations of food insecurity.[6,7] Prevalence of HIV infection was estimated in Niger at 0.7 % in 2006.[8] This remained stable since 2002 (0.9%).[9] Niger was economically last ranked in the United Nations Development Program classification for the second consecutive year in 2006, with 85% people living with less than two dollars a day.[10] According to the Food and Agriculture Organisation of the United Nations, although food availability was estimated at 2 100 kcal per person per day in Niger, 32% of the population suffered from undernutrition during the years

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2002-2004.[5] During the 2005 nutritional crisis, Niger received international assistance. Young malnourished children (under five years old) were the main beneficiaries of these programs. Support was secondary enhanced and all beneficiaries were treated principally with ready to use therapeutic food (RUTF). But a lot of vulnerable persons remained excluded and food needs of these individuals and their families still were not met. Although already six ART prescribing centres were affiliated to the national program for HIV treatment in the country in 2005, none received food support for patients.

This study started simultaneously with the introduction of a new Family Nutritional Support (FNS) for PLWH under ART. The purpose was to determine whether this type of program fostered improved health, immunologic and nutritional status of PLWH, next to ART introduction. Positive findings from this targeted nutritional program would further justify its humanitarian and sensible outcomes.

MATERIALS AND METHODS

This study was conducted in the "Ambulatory Treatment Centre" (ATC), a centre intended by PLWH ambulatory care in Niamey, managed by the Niger Ministry of Health and the French Red Cross. It included a day care unit, consultations, a laboratory and a pharmacy. On annual ATC assessment by the 2007/01/01, the ATC of Niamey was currently following 1426 patients including 529 patients receiving ART (41% of PLWH under ART in Niger). This study was proposed to patients of this centre. Only those who met the inclusion criteria could participate.

At ATC inclusion, social and demographic characteristics, medical and AIDS history were recorded. Medical follow-up data were routinely obtained on standardised forms and registered into FUCHIA monitoring software (Epicentre, Paris). Informed consent, permitting statistical analysis of medical data in an anonymous way was obtained after explanation in local language. Level of understanding was assessed for every patient. Patient's refusal of data registration did not exclude them from receiving any treatment. The study has obtained approval from medical staff at ATC, from the ethic committee of the University of Mediterranee (Marseille, France) and from the French Red Cross.

Medical follow-up was the same for all patients. Physical examination was scheduled once a month for anthropometric measures, research for new symptoms, diagnosis, and for treatment prescription. A standardized questionnaire was filled up with collected data. Weight was determined in the ATC with the same balance and height was measured with a single height gauge. Blood cell count was performed twice a year with a CD-4 cell count and haemoglobin dosing. Blood tests were conducted in the ATC laboratory.

The National HIV infection care protocol was followed throughout the study. This protocol, elaborated by Nigerian experts in the HIV care, according to WHO recommendations,[1] detailed ART guidelines, biological follow-up, and OI treatment. Recommendations were not modified during the study. Antiretroviral therapy and OI treatments were supplied by the Niger National Initiative to Access to ART. Anti tuberculosis treatments were furnished by the National Program to Fight Against Tuberculosis.

Episodes of pneumonia, diarrhoea and dermatological disorders were diagnosed by history and physical examination, and confirmed by either chest radiograph or direct examination of samples. Pulmonary tuberculosis was confirmed by presences of Koch bacillus in light microscopic examination of sputum. Tuberculosis of lymph nodes was confirmed by ultrasonic tomography. Opportunistic infections such as cerebral toxoplasmosis, neuromeningal cryptococcosis, or neuropathy were confirmed by the success of specific treatments. Adherence was assessed on follow up consultation with help of patient interviews, checking remaining tablets in ART boxes and possible oversights of adherence. Chest radiograph and ultrasonic tomography were realized within the Niamey National Hospital. Exams were charged to outpatients but solidarity funding was available if patients couldn't afford it. Investigation for Koch bacillus in direct examination of sputum was performed at the National Anti-Tuberculosis Centre.

Study intervention

There were two selection criteria for receiving FNS: 1) receiving ART and 2) a CD-4 cell count under 200/mm^3, at one of the two last blood sampling and/or develop a clinical advanced stage of AIDS (World Health Organisation (WHO) stage III or IV) and/or body mass index (BMI) <18.5 kg/m². Pregnant and breastfeeding women received FNS but were excluded from analysis.

Patients in the FNS group received a family food ration once a month after follow-up consultation during the six months study. A preliminary social investigation determined the number of people the patient was in charge of, in order to cover all the family's food needs. This ration was furnished by the World Food Program (WFP) according to WHO recommendations.[11,12] Food energy intake was calculated on the basis of 2250 kcal/person/day obtained with 500, 100 and 30 g/person/day respectively of cereal, legume (dry peas and not containing vegetables) and vegetable oil strengthened with vitamin A (75 g of proteins namely 300 kcal). Patients received nutritional advices: they needed to eat habitual food ration plus the FNS. The FNS group was observed during the six months when participants received the food support. Blood tests were realised as scheduled during personal patient follow-ups. They were not performed similarly timed with clinical follow-up and FNS. Database of the FNS group was censored on 2007/03/31. It included patients who had received six months of FNS.

The control group was retrospectively selected with patients meeting the same criteria (ART, CD-4 cell count) and followed in the same ATC the year before. Patients in the control group had received the same monthly clinical follow-up during the six months study. They received nutritional advices to increase their food intake as much as tolerated and economically possible but have not been provided any supplement. Data for the control group were collected during the six months following the first medical exam and similarly timed with blood tests. Database of control group was censored on 2006/03/31. Patients

satisfying inclusion criteria in both periods were excluded from the FNS group for analysis.

Statistical analysis

Data registered in patient medical files were collected. Patients receiving ART for less than one year were compared with the patients receiving ART for less than one year plus nutritional support. Statistical analysis was performed to test differences between the FNS and control groups. Missing data were omitted.

Survival analysis was conducted with log-rank test and multivariable Cox model. Significance level was p=0.05. Variables integrated in the multivariable model, were as usual the most relevant (in the literature, statistically associated or clinically significant). WHO stage is a clinical composite score (including BMI, tuberculosis and opportunistic infections). Thus it was impossible to integrate the same multivariable model as variables inherent to it. The initial and incident status of tuberculosis and opportunistic infections were treated like dummy variables - i.e. it was thought illogical to consider only one initial infection but not if incident. Intermediary variables were excluded from the multivariable model (ex: haemoglobin, antiretroviral regimen).

RESULTS

Sixty two and 118 patients meeting inclusion criteria were included respectively in FNS and control groups. Initial and final patients' characteristics are respectively outlined in Table 1 and 2. WHO stages, BMI, ages and CD-4 cell counts did not significantly differ in the two groups at the beginning. There were more women in the FNS group (p<0.005). Respectively, 22 (35.8%) and 56 (47.5%) patients in FNS and control groups had initial WHO stage III or IV (NS). Initial CD-4 cell count was not significantly different between the two groups (mean: 200 [179; 221]). At inclusion, 5 (8.1%) and 26 (41.9%) patients in the FNS group and 12 (10.2%) and 63 (53.4%) controls had initial CD-4 cell count respectively less than 50 and 200/mm^3 (NS). Respectively, 47 (75.8%) and 87 (73.7%) patients in FNS and control groups received the following ART regimen: zidovudine, lamivudine and nevirapine (NS). Others ART regimens were adapted to drugs interactions (mainly anti-tuberculosis agents) and side effects. Stavudine was switched to zidovudine for 3 and 17 patients respectfully in FNS and control groups and to abacavir for 1 patient in FNS group (NS). Nevirapine was switched to indinavir (ritonavir boosted) for 2 and 5 patients respectfully in FNS and control groups and to efavirenz for 13 and 22 patients in FNS and control groups (NS).

Thirteen patients died during the study period (global mortality rate over the two groups=12.7%). Only one patient died in the FNS group (mortality ratio=0.19; p<0.05). Lower survival was significantly associated with initial WHO class III or IV (mortality ratio=7.0; p<0.005) and tuberculosis (either initial or incident; p<0.005). Lower survival was statistically associated with lower initial haemoglobin level (p<0.05). But there was no clinical significance since initial haemoglobin rate was

Table 1. Characteristics of HIV infected patients under ART at beginning and end of follow-up

	FNS group[†]		control group		p-value
	N	(%) ; [IC 95 %]	N	(%) ; [IC 95 %]	
Patients	62		118		
Sex (male)	19	(30.7)	73	(61.9)	< 0.005
Age (years; median)	38.0	[35.2; 39.7]	38.5	[36.8; 39.8]	NS
BMI (kg/m²)					
< 16.5 (Severely underweight)	9	(14.5)	7	(6.4)	
16.5-18.4 (Underweight)	18	(29.0)	26	(23.6)	
18.5-24.9 (Normal)	25	(40.3)	67	(60.9)	NS
25-29.9 (Overweight)	7	(7)	7	(6.4)	
≥ 30.0 (Obese)	3	(4.8)	3	(2.7)	
Clinical Status					
WHO stage III/IV	22	(35.5)	56	(47.5)	NS
Tuberculosis disease	8	(12.9)	14	(11.9)	NS
Opportunistic infection	13	(21.0)	23	(19.7)	NS
Duration under ART before inclusion (months; median)	5.9	[6.8; 10.7]	5.8	[5.3; 8.7]	NS
CD-4 + cell count (per mm3)					
< 50	5	(8.1)	12	(10.2)	
50-199	26	(41.9)	63	(53.4)	NS
200-350	23	(37.1)	30	(25.4)	
> 350	8	(12.9)	13	(11.0)	
Haemoglobina (g/dL; mean)	11.3	[10.8; 11.9]	11.6	[11.2; 12.0]	NS
Antiretroviral regimen AZT+3TC+NVP	47	(75.8)	87	(73.7)	NS

[†]Family Nutritional Support

Table 2. Final evaluation of patients

	FNS group[†]		control group		*p*-value
	N	(%) ; [IC 95 %]	N	(%) ; [IC 95 %]	
Clinically evaluable patients	61	(98.4)	97	(82.2)	< 0.005
Final BMI stage					
BMI evolution (kg/m²; mean)	+ 1.0	[0.6; 1.5]	+ 1.2	[0.8; 1.5]	NS
Final BMI (kg/m²; mean)	21.9	[20.6; 23.1]	21.9	[21.2; 22.7]	NS
WHO stage evolution					
Deterioration	2	(3.3)	3	(3.2)	
Stable	32	(52.5)	49	(51.6)	NS
Improvement	27	(44.3)	43	(45.3)	
Final WHO stage III/IV	4	(6.6)	12	(12.4)	NS
Events during follow-up					
Incident tuberculosis	1	(1.6)	1	(1.0)	NS
Incident OI	12	(19.7)	19	(19.6)	NS
Adherence to ART[‡]	61	(98.4)	82	(77.4)	< 0.005
Biologically evaluable patients	60	(96.8)	100	(84.7)	< 0.05
CD-4 + cell count (per mm³)					
CD-4 + cell count evolution (mean)	+ 114	[76; 152]	+ 68	[46; 89]	< 0.05
Final CD-4 + cell count					
< 50	0	(0)	4	(4)	
50-199	18	(30)	36	(36)	NS
200-350	17	(28.3)	28	(28)	
> 350	25	(41.7)	32	(32)	
Final haemoglobina (g/dL; mean)	12.3	[11.9; 12.7]	12.9	[12.5; 13.2]	0.05

[†]Family Nutritional Support; [‡]in intention to treat

respectively 11.6 g/dL [11.3; 11.9] and 10.0 g/dL [9.0; 11.0] for surviving and dead patients. Survival was also found not to be associated with sex, age, OI (initial or incident), type of ART, initial CD-4 cell count. Mortality was not significantly prevented in the small subgroup of initially malnourished patients but only one patient receiving FNS died (mortality rate=7.7%) while four died in the control group (mortality rate=22.2%). Survival was adjusted by multivariable analysis for sex, age, initial low BMI and activation of tuberculosis. This showed the persistence of the protection provided by the FNS (RR=0.1 [0.01; 0.93]; $p<0.05$), in terms of initial and incident tuberculosis reactivation (respectively RR=3.3 and 48.8; $p<0.005$) and the suppressed risk of initial malnutrition Table 3.

Sixty-one and 97 patients had clinical pattern evolutions (BMI, WHO stage and OI) assessable respectively in FNS and control groups. Sixty and 100 patients had biological patterns (CD-4 cell count, haemoglobin rate) evolution assessable respectively in FNS and control groups. There was no difference between the two groups for BMI evolution and outcome. BMI increase was higher when there was an initial malnutrition ($p<0.05$), when length of ART before study period was less than six months ($p<0.005$), and when initial WHO stage was III or IV ($p<0.005$). Clinical status evolution, evaluated with WHO staging, tuberculosis and OI outcome was not significantly different between the two groups among surviving assessable patients. Respectively, 27 (44.3%) and 43 (45.3%) patients in the FNS and control groups showed an amelioration of their WHO stage.

Adherence was significantly improved for patients receiving FNS compared to controls. Respectively 61 (98.4%) and 82 (77.4%) patients assigned to FNS and controls remained adherent to ART ($p<0.005$). Increase of CD-4 cell count was 1.7 higher in the FNS group ($p<0.05$) and neither related with incident OI nor tuberculosis. Increase of CD-4 cell count remained significantly associated with FNS (RR=43.0 [4.5; 81.5]; $p<0.05$) even when taking in account confusion related to the type and length of preceding ART, initial CD-4 cell count, initial OI or tuberculosis and length of biological follow-up (data not shown).

DISCUSSION

We found that the energy intake increase from FNS during six months combined with ART for PLWH produced significant benefits in survival, CD-4 cell count, and adherence to treatment. Mortality rate was reduced from 16.9% to 3.2% in the FNS group ($p<0.05$). The increase in CD-4 cell count was 1.7 times greater in the FNS group ($p<0.05$), a substantial amount in this relatively short period of time. All the findings underwent while there was a trend although non-significant ($p=0.08$) to have recruited more underweight patients in FNS group at the beginning of the study. Thus, this research showed evidences of reducing the risk of progression to the primary AIDS and death outcomes.

Braitstein *et al.* found that mortality was higher in low-income settings during the first months of ART.[4] A controlled trial led by Paton *et al.* had explained a part of this difference of survival, by a high prevalence of malnutrition.[13] They found that patients starting ART with moderate to severe malnutrition were six times more likely to die than those with normal nutritional status. These studies admitted ART to improve nutritional needs. In Patons' study, patients had begun ART for less than one year. Factors such as nutritional deficiencies and co-infections with endemic pathogens are also admitted to affect immunologic and virologic responses to ART.[4] In spite of these partial evidences, a recent Cochrane meta-analysis didn't show any significant effect of macronutrient supplementation on morbidity and mortality in PLWH.[14] To the contrary, survival was significantly improved in our FNS group of PLWH receiving ART.

Paton *et al.* found a trend - although non-significant - towards a lower CD-4 cell count response under ART in the patients with moderate to severe malnutrition.[13] We found similar non-significant trend in every group. CD-4 cell count increase in the FNS group was only + 94.1/ mm^3 [43.8; 144.4] for patients with initial BMI <18.5 kg/m^2 compared to + 130.1/mm^3 [73.4; 186.8] for other patients (NS).

At the end of the study, there was no difference in BMI increase between the two groups in terms of surviving and evaluable patients. Our observation is in accordance with several studies. Schwenk A *et al* evaluated the effects of nutritional counseling, with or without oral supplements for eight weeks in PLWH with recent and ongoing weight loss.[15] At the end of observation, fat free mass had significantly increased in both treatment groups but non-significant difference were observed for weight and body cell mass. No impedancemetry was followed in our study. A controlled trial evaluated nutritional support in patients with newly diagnosed tuberculosis and wasting and showed a greater increase in body weight in the supplemented group after 12 weeks, but no significant difference after 24 weeks.[16] Luis D *et al.* found that oral nutritional support for a 3-months period permitted a significant body weight gain versus isolated nutritional counselling.[17] This weight increase concerned fat mass. No benefit was found with regard to BMI increase in the FNS group but few patients were severely malnourished, median initial BMI was 19. Furthermore, ten patients with a BMI superior to 25 were included in each group, respectively 11.8% and 9.1 % in FNS and control groups (NS). These inclusions were in accordance to the WHO stage and CD-4 cell count of patients with no respect to their BMI. It was in reference to the family context discussion - see following - and the proportional energetic needs related to their health status. WHO stage evolution was not different between the two groups. The study period was too short to show any difference.

Sex ratio of PLWH was explained by the evolution of the recruitment within ATC during the two years of the study. Engaged male had been more likely to be diagnosed by health services of their firms. Thus, they had been the first PLWH to consult when the ART program had opened (control group). At the time the FNS program begun, there were more women on inclusion as long as preceding patients didn't meet anymore inclusion criteria. Survival remained strongly associated to FNS after adjusting with sex, age and initial BMI (Table 3). Thus any potential confounder linked to socio-cultural conditions evolution in recruitment were taken into account for analysis.

Table 3. Multivariable survival analysis of HIV infected patients under ART - global mortality: 12.7%

	Unadjusted RR	[95% CI]	*p*-value	Adjusted RR	[95% CI]	*p*-value
Age (years)						
< 30	1	-		1	-	
30-39	0.61	[0.10; 3.75]	0.92	2.27	[0.22; 23.1]	0.21
≥ 40	1.38	[0.28; 6.65]		7.48	[0.66; 84.6]	
Sex (male)	1.20	[0.40; 3.60]	0.74	0.69	[0.14; 3.22]	0.63
Initial BMI < 18.5 kg/m²	1.81	[0.52; 6.28]	0.35	3.50	[0.84; 14.6]	0.09
Opportunistic infection						
Initial	3.83	[1.11; 13.2]	0.15			
Incident	1.69	[0.30; 9.33]				
Tuberculosis disease						
Initial	3.77	[0.94; 15.1]	0.002	3.26	[0.58; 18.5]	0.002
Incident	11.3	[2.52; 50.9]		48.8	[5.41; 440.7]	
Initial WHO stage III/IV	6.25	[1.35; 28.9]	0.02			
Initial CD-4 cell count	1.00	[0.99; 1.00]	0.28			
Initial haemoglobin rate	0.73	[0.56; 0.95]	0.02			
Antiretroviral regimen (AZT+3TC+NVP)	0.71	[0.21; 2.36]	0.57			
FNS[†]	0.18	[0.02; 1.40]	0.10	0.10	[0.01; 0.93]	0.04

[†]Family Nutritional Support

Patients in FNS and control groups were each enrolled after they started ART respectively for a median time of 5.9 and 5.8 months (NS). The early response to ART was not aimed to be studied. Thus, this gap between ART initiation and FNS study was not different between the groups and so does not cause any selection bias.

Patient adherence to FNS associated with ART was remarkable. At the time of the generalization of ART in developing countries, fight against HIV drug resistance is one of the top priorities of public health. WHO established the Global HIV Drug Resistance Surveillance Network to assist countries in monitoring for the emergence of HIV drug resistance.[18] ART adherence is the best weapon in preventing these resistances.

To our knowledge, family food distribution for PLWH was not evaluated in any published study. Besides avoiding sharing patient directed ration, we can see two aims in this shape of distribution. The preparation of family common meal is essential in African culture with a unique dish for lunch.[19] In African families, the fear of cutaneous contagion is often present and stigmatizes PLWH. Local associations of PLWH organize "community meals" between patients and with related families. This aims to collect persons touched by the epidemic and to decrease patients' stigmatisation in friendly place. Parallel can be drawn with the familial meals furthermore supported with FNS. Distribution of a family ration of food strengthens social benefit. The incapacity of PLWH to supply the family needs is a problem for home-returning in precarious economic situation. The precariousness urges families to exclude the impaired patient constituting a load.[20] For the Joint United Nations Programme on HIV/AIDS (UNAIDS), programs with aims to decrease stigmatisation need three steps: understanding and commitment against discrimination; providing leadership on the necessity of reducing stigma and finally, facilitating the inclusion of the fight against stigma in national HIV strategic planning.[21] Our program followed these three rules.

International recommendations are clear for the care of malnourished children in times of crisis. Adults' malnutrition care is less consensual. WHO, United Nations Children's Fund (UNICEF), WFP have conjointly recommended RUTF in the fight against children severe acute malnutrition.[22] But, in previous studies, RUTF was directed to patients only and not to the whole family. It remains to be established how it can be accepted in families in developing countries for the long term. Distribution of FNS inscribes this type of program in better respect of community-based therapeutic care.[23]

FNS like ART showed survival benefit after only six months of treatment. WHO, UNICEF, WFP recommend supporting the development and evaluation of nutrition rehabilitation protocols based on local foods in countries where poor families have access to nutrient-dense food.[22] Most of the products distributed in this FNS program are not yet grow on Nigerian soil.[24] Although food was supplied by the WFP, such production is partially possible and would have to be promoted in many developing countries.

In our study, International guidelines were followed: clinical WHO recommendations (physicians' experiences in HIV care, medical and biological surveillance, and ART and OI treatment guidelines) were followed; the structure of the program was integrated to the national health system and we showed benefits in survival, and increasing of CD-4 cell count.[18,25]

CONCLUSION

This study showed a positive impact from FNS after six months for PLWH recently initiating ART in a developing country. Efforts to provide access to ART that do not incorporate other cost-effective interventions into a comprehensive primary care plan might limit the effect on morbidity and mortality among PLWH in such settings.

International communities defend generalization of food support for PLWH for pharmacological, social, ethical, and clinical purposes. The ethical issue is mainly over extending the support to only the affected population while the general public might also need this type of nutritional intervention. But this study is so significant that its results definitely outweigh the supposed ethical issues. Other integrated approaches by national and international co-operations are welcomed by the author to overcome these issues.

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AUTHOR DISCLOSURES

All the authors declare that they have no conflicts of interest in this study.

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Original Article

Family nutritional support improves survival, immune restoration and adherence in HIV patients receiving ART in developing country

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家庭營養支持改善發展中國家接受抗逆轉錄病毒治療的愛滋病人其存活、免疫修復及依附

在發展中國家，以抗逆轉錄病毒治療有愛滋病毒(HIV)的人仍然在進行中。營養不良是引起後天免疫缺乏及夭折的另一個原因。本評估計劃評量在西非的次撒哈拉區域，家庭營養支持對於第一年接受抗逆轉錄病毒治療的病患之影響。對 CD-4 細胞計數<200/nm^3 且/或者病情為 WHO 等級 III/IV，或者身體質量指數 <18.5 kg/m^2 且接受抗逆轉錄病毒治療的病人，提供家庭營養支持。追蹤比較 62 名接受支持的病人和 118 名一年前只接受抗逆轉錄病毒治療的病人。家庭營養支持組與控制組的平均身體質量指數分別為 20.7 與 20.5，他們的 CD-4 細胞計數平均為 217 與 191/mm^3(兩組無顯著差異)。支持組與控制組分別有 22 名(36%)及 56 名 (48%)屬於 WHO 等級 III/IV(兩組無顯著差異)。有 1 名接受家庭營養支持及 12 名控制組病人過世(死亡比例=0.19；p<0.05)。支持組 CD-4 細胞計數增加約高 1.7 倍(支持組與控制組分別增加+114 與+68 CD-4 細胞/mm^3；p<0.05)，對治療的遵循度亦較佳(p<0.005)。WHO 等級進程及身體質量指數沒有改變，或許是因為這個研究期限不長。對於發展中國家開始接受抗逆轉錄治療的愛滋病人，給予家庭營養支持，在 6 個月後顯示有正向的效果。這項家庭介入可以結合愛滋病治療介入，成為一個有效且完整的社區基礎的初級照護。

關鍵字：後天免疫缺乏症候群、發展中國家、營養支持、存活、免疫修復