A REPORT ON

The effect of nutrition supplementation on treatment outcomes among clients on ARVs in Rungwe district (South west Tanzania)

Cover photo: *Clients on ARVs who received Nutrition Supplementation through HDT project in Lufingo Ward, Rungwe district waiting for the interview. Photo by HDT.*

Report by Dr. Mselenge Mdegela (MD, MMed (OBS/GYN)

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P.O.BOX 65147 Dar es Salaam

www.hdt.or.tz

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ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ARVs	Anti retroviral drugs
HDT	Human Development Trust
HIV	Human Immunodeficiency Virus
NACP	National AIDS Control Program
NCTP	National Care and Treatmrnt Plan
NMSF	National Multisectoral Strategic Framework
PLWHIV	People Living with HIV
TACAIDS	Tanzania Commission for AIDS
THMIS	Tanzania HIV/AIDS and Malaria Indicator Survey
WHO	World Health Organization

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1. Abstract

Background

HIV and nutrition are intimately related. The demand for nutrition for PLHIVs is higher than a person who is not infected who are on the same age and activity level. The demand for nutrition is higher and special nutrient deficiencies develop when a patient is started on ARVs. Nutrition consideration therefore is vital for successful care and treatment outcomes among PLHIVs especially those on ARVs.

Aim of the study

The study was conducted to validate prior information that resulted from an intervention done in Rungwe district by HDT between January and June 2009. The intervention involved giving nutrition supplements to PLHIVs on ARVs for a period of six months. Initial data showed more increase in CD4 count and weight among individuals on ARVs receiving supplements as compared to those who didn't. Whereas the proportion of PLWHIVs with CD4 counts below 200 got reduced by 56% that of PLWHIVs with CD4 counts between 400 and 600 increased by 244% (HDT, 2009).

Methodology: Clients data was obtained from patient files and through face to face interview with some clients. Data was coded, entered and analyzed using Epi Info and SPSS computer programs respectively.

Results: There was a similarity in socio-demographic variables in the two groups which would allow parallel comparison. A significant increase in CD4 count among the group given nutrition supplementation was clearly shown after six months follow up ($p<0.001$). On average, weight gain was higher among the group that was given nutrition supplementation but this was not statistically significant. Occurrence of opportunistic infections and adherence to medication was similar between the two groups.

Conclusion: The rate of CD4 count increase is higher when nutrition supplementation is given to PLHIVs who are on ARVs. This would lead to a faster improvement in general health. Thus, this group of people may resume their functional capacity earlier and in the long run lower costs of care.

2. Introduction:

Tanzania is one of the countries in Sub-Saharan Africa that is highly affected by the HIV/AIDS pandemic. The current prevalence among the age group 15 – 49 years stands at 5.7% with more females being affected, 6.6% against 4.6%. The prevalence in the urban areas is almost double that of the rural areas, where as among women the prevalence is 11% in the urban; it is only 5% in the rural areas. Among men it is 6 and 4 percent respectively. There is a wide country geographic variation in prevalence; whereas the prevalence in Kigoma region is only 1.5%, for Iringa region it is more than ten times the value (ie 16.8%). The prevalence for Mbeya region is 7.6% (THMIS 2007/08).

The Tanzania response to the scourge started in 1985 when the National AIDS Control Program (NACP) was formed under the Ministry of Health. It was supported by World Health Organization (WHO) and the Global Program for AIDS. After several reviews and recommendations, it was clear that there was a need for a multisectoral approach and form a body that will oversee the multisectoral response. It was in this light that in 2000 the Tanzania Commission for AIDS (TACAIDS) was established by act of the Parliament.

TACAIDS working with other stakeholders has enabled development of several guiding documents related to policy and implementation of programs. These includes the National HIV Policy (2001), the National Multisectoral Strategic Framework (NMSF) 2003-7, HIV law in 2008 and the revised NMSF (2008 – 2012) which has more focus on wide participatory approach. The non-health monitoring and evaluation system (TOMSHA) has been developed and more collaboration between non-health and health sector is being realized.

There is active research in progress, both nationally and globally, regarding HIV/AIDS prevention, diagnosis, treatment and care. Findings from the research help to shape the approach towards the disease. These are sources of reasons for the changes and amendments made to the messages used in the IEC materials, to matters regarding reproductive health, treatment regimens, and diagnostic algorithm.

The National Care and Treatment Plan for HIV and AIDS (NCTP) aims at, strengthening social support for care and treatment among PLHIVs in Tanzania, through home based care, local support groups and treatment partners. This is a demanding task that calls for partners and stakeholders' concerted efforts in implementing this comprehensive plan.

HDT is a non for profit, non-governmental organization that has contributed to provide care to PLHIVs through one of its community development pillars in Dar es Salaam, Mbeya and Kagera. In Rungwe district HDT has implemented a nutrition support intervention among PLHIVs on ARVs, enabled some of them to run small scale income generating activities, strengthening the Community Home Based Care System and contributed to taking care of Most Vulnerable Children (HDT, 2009).

This piece of work was done to draw evidence whether nutrition supplementation has an extra value among clients receiving ARVs.

1.0. Literature review

1.1. HIV/AIDS and Nutrition

As Anti Retroviral Therapy (ART) interventions scale up in resource limited settings like Tanzania, addressing food and nutrition implications becomes a critical component of care and support programs and services. Interactions between ART and food/nutrition can affect medication efficacy, nutrition status and adherence to drug regimens. Drug-food interactions consist of the effects of food on medication efficacy, the effect of medication on nutrient utilization, the effects of medication side effects on food consumption and unhealthy side effects caused by medication and certain foods. Service providers providing care to PLHIVs need to understand their specific food and nutrition requirements. In light of the type of medications being taken and the local food and nutrient availability they devise feasible plans to meet the requirements (Tony, 2004).

Individuals infected with HIV have special nutritional needs particularly increased energy and protein requirements irrespective of whether they use ART. It is recommended, for example that, symptomatic PLHIVs increase their energy intake by 20 – 30% over the requirements for non-HIV infected persons of the same age, sex and physical activity. They should as well meet the protein and micro nutrient intake levels recommended for healthy individuals. Proper nutrition helps to strengthen the immune system, reduce opportunistic infections, optimize response to medical treatment and slow the disease progression (WHO, 2003).

Deficiencies of vitamins and minerals such as Vitamins A, B-complex, C, and E and Selenium and Zinc which are needed by the immune system to fight infections are common in PLHIVs (Semba RD, 1999, Kupka 2002).

Daily micronutrient supplementation has been shown to improve body weight, improve CD4 counts and reduce the incidence of opportunistic infections in small studies of adults with AIDS, including those on ARVs. Larger clinical trials demonstrated that daily micronutrient supplementation increased survival in adults with low CD4 cell counts, prevented adverse birth outcomes when given during pregnancy and reduced mother – to – child HIV transmission in mothers with advanced disease. (Shabert JK 1999, Muller F 2000, Mocchegiani E 2000, Jaimton S, 2003, Fawzi WW 1998).

Certain foods affect the efficacy of certain ARVs by affecting their absorption, metabolism, distribution or excretion. Food enhances the efficacy of some ARVs and inhibits the efficacy of others. For example a high energy, high fat, high protein meal decreases absorption of Indinavir (a protease inhibitor). A high fat meal increases the bioavailability of Tenofovir (a NRTI). If not properly managed, these interactions result in reduced effectiveness of the therapy. Consequently, some ARVs should be taken with food, others with or without specific types of foods (Pronzky, 2001).

Side effects of some medications can lead to reduced food intake or reduced nutrient absorption that exacerbates the weight loss and nutritional problems experienced by PLHIVs. ARV side effects, such as nausea, taste changes and loss of appetite may reduce food consumption while side effects such as diarrhea and vomiting may increase nutrient losses. For example Zidovudine can cause anorexia, nausea and vomiting. Didanosine causes diarrhea and vomiting, loss of appetite and mouth dryness. Reduced nutrient intake and absorption exacerbates anorexia resulting into a vicious cycle that drives the patient down trench. PLHIVs taking such drugs may need special nutrient supplementation to cater for the specific losses they experience and in the process break the vicious cycle (Tony, 2004).

It is important to take note that in addition to ARVs PLHIVs often take other drugs to treat opportunistic infections. Common drugs include those that treat Tuberculosis, oral or oropharyngeal candidiasis, pneumonia, intestinal and fungal infections which occur as a result of weakened immunity. In tropical countries drugs like antimalarials and antibiotics for enteric fever are commonly taken. Nutrition considerations are important to ensure safety and efficacy of all drugs commonly taken by PLHIVs.

1.2. Care and treatment in Tanzania

HIV care and treatment services in Tanzania are integrated in the existing health care system. This is guided by the National Care and Treatment Plan for HIV and AIDS (NCTP) which started to operate in 2004. Through this plan the National AIDS Control Program (NACP) coordinates the scale up of HIV care and treatment services in all health facilities in the country (Government, FBOs and NGOs). The

expectation was to have at least 440,000 people on ART and more than 1.2 million PLHIV yet eligible for ART on surveillance by the end of 2008 (NACP, 2009).

The other three goals of NACP are to strengthen the health care infrastructure through the expansion of the human resources, facilities and equipments and comprehensive training in the care and treatment of PLHIVs, to foster information, education and communication efforts by focusing on increasing public understanding of care and treatment services, reducing stigma and supporting ongoing prevention campaign and to strengthen social support for care and treatment of PLHIVs in Tanzania. HDT implementation of HIV interventions in Mbeya focuses on strengthening social support for care and treatment of PLWHIVs.

To date there are 563 health facilities that offer ART (NACP 2009) a more than 100% increase from 247 centers in 2003 (MoH, 2003). The plan is to increase more centers and increase the number of qualified staff providing care from …..to……by……. (sorry I can't find this figure).

Home Based Care (HBC) is a vital part of a continuum of care between the health care facility and the community of PLHIV. Civil Society Organizations and the network of PLHIV provide the bulk of these services including treatment of opportunistic infections, economic and social support for persons, families and communities affected by AIDS. Despite impressive numbers of support project, major concerns remain about the quality of care provided. The issue of food and nutritional support to PLHIV remains a major challenge in the provision of HBC services. The fact that most HBC service providers are non health care workers calls for more effective training and coordination between the health care facilities and the community. (NMSF 2008 – 2012).

The National Policy on HIV/AIDS Section 7.1(a) details the rights of PLHIV in care and treatment. "… *PLHIV shall have access to holistic health care. This includes clinical, medical care, counseling and social welfare services. Health care shall extend beyond the hospital precincts to include planned discharge and backups for Home Based Care*…[1]"

1.3. Nutrition and People Living With HIV

There is enough evidence that receiving appropriate nutrition helps improve the health and quality of life of HIV-infected individuals (Kotler, 1990). Individuals who receive antiretroviral therapy (ART) with appropriate nutrition are more likely to improve their general health and more likely to adhere to their

[1] Prime Ministers office; National Policy on HIV, November 2001. Page 6

medications, thus helping them rejoin the work force and improve food security for themselves and their families. While clinical care providers, program managers and other stakeholders increasingly recognize the critical importance of nutrition for the treatment of HIV and AIDS, interventions that link nutritional support to treatment are relatively new.

People on ARV treatment in resource poor settings may lack access to sufficient quantity and quality of food to complement their treatment, offset side effects, and encourage adherence (Byron, 2006)

A community intervention project named “planting and eating soya beans” was implemented in a rural area in China among PLHIV. The aim was to increase their protein intake in a sustainable manner by providing them with soya bean seeds and assisting them to grow the beans. After harvesting they showed them how to prepare the seeds and encouraged them to eat it daily. An assessment done four months later showed that they felt better, had general improvement in their haemogram and had higher CD 4 counts. (Guoping Ji, 2010). This could be an important consideration when thinking of sustainable solutions that are cost effective in the low resource countries.

Households with a chronically ill adult member face progressive threats to their livelihoods (Donovan, 2003). Subsequent deterioration in household food security can in turn jeopardize not only the nutritional status of the ill member but also the nutritional security of others in the household. Reduced income, increased expenditures (on health care and transport etc), loss of labor productivity, and more time being reallocated away from production to caring for sick members, can all cumulatively precipitate and exacerbate household food insecurity (Gillespie 2006).

Nutritional support should be an integral part of a comprehensive response to HIV/AIDS. There is evidence that nutrient intake can improve antiretroviral absorption and tolerance. Receiving appropriate nutrition can help improve the health and quality of life of HIV-infected individuals. Individuals who receive antiretroviral therapy (ART) with appropriate nutrition are more likely to regain weight and more likely to adhere to their medications, thus helping them rejoin the work force and improve food security for themselves and their families (WHO, 2005).

Improved attention to diet and nutrition may enhance ART acceptability and effectiveness and help ameliorate metabolic complications (Tony, 2004)

The new UNAIDS policy on HIV, food security and nutrition, 2008 argues that, proper nutrition is critical to realizing the full benefits of antiretroviral therapy (ART). ART itself may increase appetite and it is

possible to reduce side effects and thus help people with HIV to stay on treatment if medicines are taken with food.

According to Health Sector HIV/AIDS strategy for Tanzania 2003 – 2006, Provision of adequate nutrition is a critical component of AIDS case management. Inadequate food intake is a common reason for the rapid deterioration of the patients' physical conditions. This strategy seeks to ensure that the management of HIV/AIDS focuses both on medical and nutritional interventions. The strategy provides for collaboration with other sectors which deal with food production while giving education to patients and family care givers about nutritional supplementation using locally available foods. The target is to integrate nutrition in the training on AIDS clinical management by 2004.

The national HIV/AIDS Care and Treatment Plan 2002 – 2008 argues that from a clinical perspective, adequate nutrition, appropriate micronutrient supplementation, and the treatment of clinical malnourishment are necessary components of the comprehensive treatment of HIV/AIDS and will significantly enhance the effects of pharmaceutical therapy. Additionally, given the fact that many antiretroviral have food requirements, nutrition and antiretroviral therapy programs often need to be linked together for maximum benefit.

Malnutrition and HIV have similar deleterious effects on the immune system. In both malnutrition and HIV there is reduced CD4 and CD8 T-lymphocyte numbers, delayed coetaneous sensitivity, reduced bactericidal properties and impaired serological response after immunizations (Kroon, 1994). Improving nutrition will therefore have the effect on immunity and thus fight off the virus.

1.4. Significance of the study

The government of Tanzania is currently providing ARVs only to PLHIV. Nutritional support is not yet implemented. Partly the reason could be lack of clear local evidence among the government and other important stakeholders of the impact of nutritional support to PLHIV. This study aims at exploring the impact nutritional support has to PLHIV on ARVs in comparison to those on ARVs alone.If found that there is significant effect and then the policy will be influenced so that the care and treatment outcome can better achieve results.

1.5. **Null hypothesis:**

There is no difference in treatment outcomes between patients on ARVs receiving nutritional supplementation and those only on ARVs.

2.0. Goal:

To determine the effect of nutrition supplementation on treatment outcome (general health and other clinical parameters) among PLHIV on ARVs in Rungwe district.

Objectives:

2.1. To determine the socio-demographic profile of PLHIV on ARVs who received nutrition supplementation and those who didn't.
2.2. To determine the effect of nutrition supplementation on weight gain among PLHIV on ARVS.
2.3. To determine the effect of nutrition supplementation on CD4 count among PLHIV on ARVS.
2.4. To determine the effect of nutrition supplementation on adherence to ARVs
2.5. To determine pattern of occurrence of opportunistic infections among PLHIV on ARVs who received nutrition supplementation and those on ARVs alone.

3.0. METHODOLOGY

The study was an observational one done after an intervention. Nutrition supplementation was given to 150 clients taking ARV for six (6) months who were randomly selected. In order to make comparison another group of the same size was selected randomly as well.

The study population was clients on ARVs attending CTC in Rungwe district hospital (Makandana). The sample size was conveniently chosen.

Study constraints:

The retrospective nature of the study did not allow researchers to have a physical contact with clients to have firsthand information from them. This would have a particular importance for assessing symptoms for opportunistic infections and issues regarding adherence. Using data recorded in the files depends much on the accuracy and consistency of recorders. Migration of some clients outside Rungwe district and/or Mbeya region reduced the sample size.

3.1. Nutrition Supplementation

The nutrition supplement given is branded **e'pap The Original ®** which is an instant pre-cooked food supplement made in South Africa**,** in powder form. This was available in 500g packs. Each 100g of the supplement contain the following:

Nutrient	**Composition per 100g in KJ**
Energy	1556.00
Carbohydrates	64.00
Protein	12.50
Moisture	5.00
Total Fat	7.00
Total Dietary Fibre	10.00
Sodium	0.60
Potassium	0.45

Detailed composition including Zinc and Selenium, micronutrients that have been shown to reduce HIV disease progression (Fawzie, 2005) is found in Annex I

Clients were instructed to add two table spoonful of the supplement (powder) in a glass of warm water (300mls) and take it twice daily. One pack was used for 5 days. Clients got 6 packets monthly and were also instructed not to give it to any other person at home including their own children.

HDT staff made the supplies for the whole period ensuring that there were no stock outs. All eligible chosen clients who came to the CTC during the intervention time received the nutrient supplement.

3.2. Data Collection

Files of clients in the study group were obtained from the records department at Makandana hospital. Apparently some clients who received nutrient supplementation had shifted to other CTC centers within and outside the district. Using the registration numbers files of 77 clients were retrieved from Ikuti (23 files), Igongwe (32 files) and Mwakaleli (22 files) Health Centres.

Data from these files was collected. The socio-demographic data was obtained from the admission form and the follow up from the 'CTC 2: Patient Record Form'. The data was coded and entered manually in a computer using Epi Info 2008, version 3.5.1 program. Data analysis was done using SPSS software. Where applicable Epitable calculation in the Epi Info program was used to calculate p- value using Chi - square.

An individual interview was made with 25 clients from the nutrition group who came from different villages of Lufingo Ward, Rungwe ditrict. The Interview Guide used is Annexed (Annex III)

3.3. Research Assistants

One research assistant (a nurse midwife) from Dar es Salaam and two clinicians from Makandana Hospital were involved in data collection and entry. The two assistants from Makandana hospital had been involved in taking care of clients on ARVs at the hospital. They were oriented on the purpose of the study and the data entry template in the first day. They picked up quickly as they were knowledgeable of the details required.

3.4. Ethical Considerations

This was an observation study which involved adding an entity to clients on treatment. There was no act of harm or denying them of benefits.

A written consent was obtained from the hospital authority to allow access to the client information.

To those involved in the interview they were assured of confidentiality, anonymity and the right to opt out from the study at anytime without any personal consequences.

4.0. Results

A total of 264 files were available for data entry, 115 among those given nutrition (nutrition group) and 149 who were not given nutrition (no nutrition group). Some clients did not complete a successive six months follow up during the time nutrition supplementation was being provided. These were 39 in the nutrition group and 15 in the no nutrition group. Analysis for the socio-demographic variables was made to all 264 but the analysis with regard to CD4 count, average weight gain, Cotrimoxazole use for opportunistic infections and WHO stage was limited only to those who completed the six months followup, that is, 76 clients for the nutrition group and 134 for the no-nutrition group.

Regarding adherence, all except one client on the no-nutrition group, was reported as good in the CTC 2: Patient Record Form. There was no difference with regard to adherence in the two groups. What does good mean in terms of adherence? Were you able to verify this over the six months? Most clinicians just feel this and good may not mean anything!!!this is a tricky one!! – *This is difficult to address, the only*

information to use was the one found in the CTC 2 Patient Record Form. There was literally nothing written in the files during follow up other than filling the form. There were only 2 codes. G (good) = fewer than 2 missed days. P (poor) = 2 or more missed days. There were further codes if the adherence was found to be poor, to specify for the reason (1 – 13). So we did not have an option other than trusting the records.

Common opportunistic infections namely Tuberculosis (Anti TB use) and Cryptococcal meningitis (Fluconazole use) did not feature in both groups during the nutrient supplementation and follow up. They do not appear in the list of opportunistic infections presented.

***Table 1*: Socio-demographic variables**

N = 264

Variable	Nutrition N = 115 # (%)	No Nutrition N = 149 # (%)	*p-value*
Age 5-15 >15-25 >25-35 >35-45 >45	 1(0.8) 1 (0.8) 22 (19.1) 47 (40.9) 44 (38.3)	 8(5.4) 7 (4.7) 30 (20.1) 53 (35.6) 51 (34.2)	 *p > 0.05*
Sex *Male* *Female*	 48 (41.7) 67 (58.3)	 61 (40.9) 88 (59.1)	 *p > 0.05*
Parity/ Children Fathered 0 1-2 3-4 >4	 3 (2.6) 22 (19.1) 46 (40.0) 44 (38.3)	 18 (12.1) 40 (26.8) 49 (32.9) 42 (28.1)	 *p > 0.05*
Years been in School 0 1-7 >7	 21 (18.3) 89 (77.4) 5 (4.3)	 17 (11.4) 121 (81.2) 11 (7.4)	 *p > 0.05*
Hours travelled to Hospital 1-2 3 4-5	 68 (59.1) 38 (33.0) 9(7.8)	 140(94.0) 6 (4.0) 3(2.0)	 *p < 0.01*
Formal Employment YES NO	 1 (0.8) 114 (99.2)	 11 (7.4) 138 (92.6)	 *p > 0.05*

SOCIAL SERVICES *Electricity* YES NO *Tap Water* YES NO	 4 (3.5) 111 (96.5) 20 (17.4) 95 (82.6)	 26 (17.4) 123 (82.6) 75 (50.3) 74 (49.7)	 *p < 0.05* *P < 0.05*
Number of people living at home 0-5 >5	 76 (66.1) 39(33.9)	 102(68.5) 47 (31.5)	 *p > 0.05*
Using Family Modern Planning YES NO	 25 (21.7) 90 (78.3)	 38(25.5) 111 (74.5)	 *p > 0.05*
Marital Status Married Not Married	 56 (48.7) 59 (51.3)	 59 (39.6) 90 (60)	 *p > 0.05*

All the socio demographic information were the same except social services (electricity and tap water use) and the time it took to travel to hospital. Otherwise, there wasn't any statistical significant difference in socio-demographic variables between the two groups. Thus the results obtained from the two groups can be fairly and confidently compared.

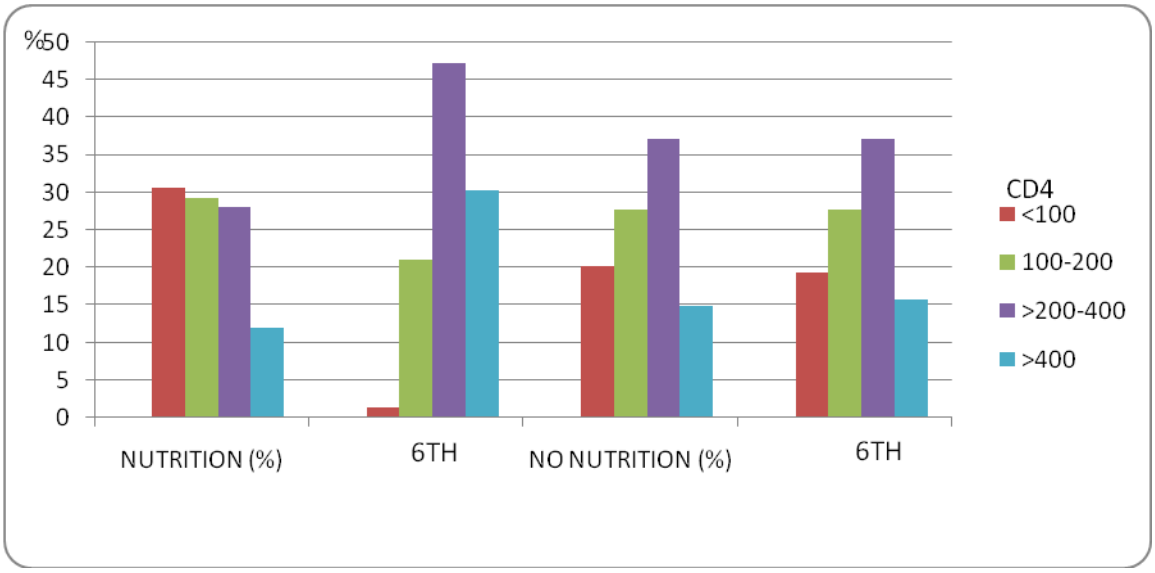
Table 2: **Symptom and Signs of the two groups before the start of nutrient supplementation**

Symptom/Signs	NUTRITION N = 115	NO NUTRITION N = 149
FEVER/GENERAL BODY MALAISE Yes No	 69 (60.4) 46 (39.6)	 86 (57.5) 63 (42.5)
SKIN/MUCOUS MEMBRANE SYMPTOMS Yes No	 37 (32.2) 78 (67.8)	 55 (36.9) 94 (63.1)
WEIGHT LOSS Yes No	 72 (62.6) 43 (37.4)	 93 (62.4) 56 (37.6)
DIARRHOEA/VOMITING Yes No	 38 (33.0) 77 (67.0)	 40 (26.8) 109 (73.2)
CHEST PAIN/COUGH Yes No	 22 (18.4) 93 (81.6)	 40 (26.8) 109 (73.2)
DYSURIA Yes No	 7 (5.3) 108 (94.7)	 6 (4.0) 143 (96.0)
ENT AND EYE SYMPTOMS Yes No	 5 (3.5) 110 (96.5)	 7 (4.7) 142 (95.3)

TMP/SMX/PCP Yes No	 3 (1.8) 112 (98.2)	 7 (4.7) 142 (95.3)

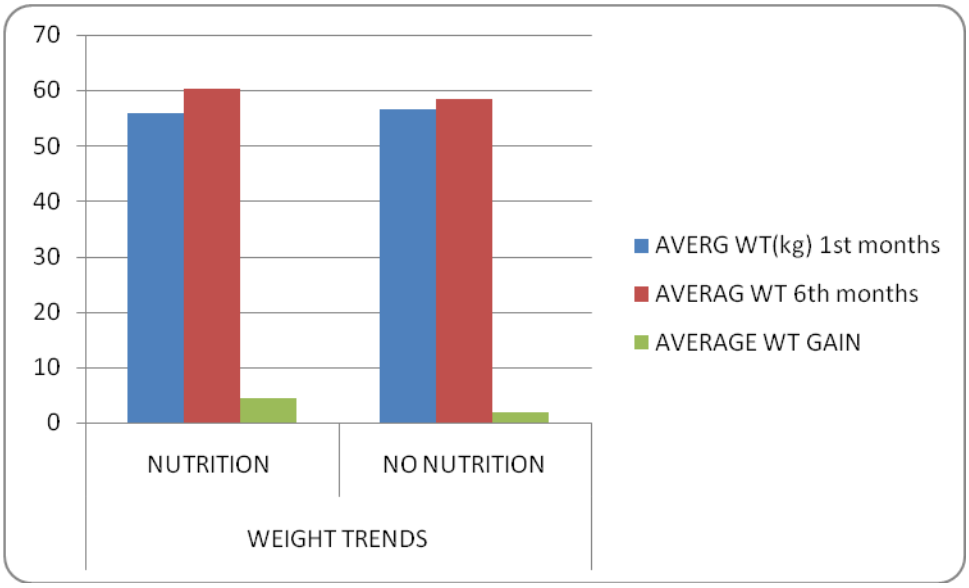
*P> 0.05 for all symptoms.
There was no difference with regard to occurrence of opportunistic infections between clients selected for nutrient supplementation as compared to those who did not.

Figure1: CD4 Counts before and after 6 months intervention with nutrition



There is a vivid reversed trend in CD4 counts among clients on nutrition supplementation after six months follow-up. At the beginning the proportion of clients with low CD4 counts is high whereas after six months this proportion is significantly reduced (p<0.001).

Figure 2: Weight gain (kg) average in the two groups



The trend shows a higher average weight gain among the group under nutrition however this was statistically not significant.

***Table 5*: Proportion of Clients on Cotrimoxazole for prophylactic/therapeutic indications**

	NUTRITION #(%)	NON NUTRITION #(%)	P-value
COTRIMOXAZOLE Before 6 Months after	 43 (57.3) 45 (59.2)	 94 (69.6) 92 (69.2)	 P>0.05

There was no difference in the proportion of clients who were given prophylactic or therapeutic Cotrimoxazole before and after the follow up in both groups.

Table 6: Laboratory Investigations: ALT and HB levels among clients in the study population

Investigation		Nutrition	No Nutrition	*p*-value
Average HB	1^{ST} MO	10.0	10.9	p>0.05
	6^{TH} MO	10.6	10.7	
Average ALT	1^{ST} MO	19.62	29.4	P<0.05
	6^{TH} MO	19.76	30.2	

The Haemoglobin level was about 10g/dL in both groups before and after the follow up.
The liver enzyme (ALT) levels were significantly higher among the no-nutrition group than the nutrition group. The tendency was preserved even at 6 months follow up.

Table 7: WHO HIV Stage

Stage	NUTRITION (%) N = 76		P-value
	Before Nutrition	**6 months later**	
1	5 (6.7)	5 (6.7)	p>0.05
2	18 (24.0)	18 (24.0)	
3	43 (57.3)	44 (57.9)	
4	9 (12.0)	9 (12.0)	
NON NUTRITION (%) N = 134			
1	15 (11.2)	15 (11.2)	p>0.05
2	33 (24.6)	31 (23.3)	
3	78 (58.2)	79 (59.5)	
4	8 (6.0)	8 (6.0)	

There was no difference in the proportion of clients belonging to the different WHO groups among the two groups before and after nutrition supplementation.

Interview Results:

Majority (75%) of clients had been on ARVs for more than two years among them 25% for more than 4 years. Twenty eight percent of them were widowed and 64% married.

All of them stated that they felt to have more energy after commencing nutrition. Some who had not gone to work in the farm for several months resumed their duties. Generalized body malaise was the symptom more reported to decrease after initiation of nutrition and it came back when nutrition supplementation was stopped.

There was improved appetite and adherence to ARVs as one of them said that he used to take medication the same time he was taking nutrition. This made it difficult for him to forget taking drugs as well. Majority suggested that the small scale projects (eg keeping swine) should continue and get more support. This will enable families earn more income, be able to support their families and improve their diets.

5.0. Discussion

HIV and nutrition are intimately related. The role of good diet in management of any chronic disease condition is of prime importance. The advent of ARVs has changed the picture of HIV/AIDS to a chronic manageable condition with increased survival rates and quality of life among clients. With the current prevalence and incidence in Tanzania, it is expected that the proportion of PLHIV will increase in the near future. Nutrition considerations become an important entity in providing care to PHLIVs.

This study was carried out particularly to prove or refute results from earlier findings that had revealed a higher increase in average weight and CD4 count among clients on ARV who received food supplementation for six months. (Community Based HIV and AIDS Interventions in Mbeya, HDT, 2009).

Earlier studies have shown that poor nutrition and HIV related adverse health outcomes contribute to a viscous cycle that may be slowed down by using nutrition interventions including vitamins and minerals (Fawzi, 2005, Jones 2006). In this study nutrition supplementation has shown to significantly raise the CD4 count. This particular finding is made strong by revealing that there was no difference in most socio-demographic variables in the two groups.

Improvement in health status of PLHIV after nutrient supplementation and a resultant increase in CD4 counts was expected. It would have manifested itself in fewer occurrences of opportunistic infections, change to a lower WHO stage and a higher individual functional status. This was however not demonstrated. Two reasons could account for this; the increase in CD4 count happened more to those who had counts of less than 200 (even more to those less than 100). Such that despite the increase in CD4 counts, it had not yet crossed the threshold for suppression of opportunistic infections. The other reason could be the small sample size and a short follow-up time.

Body Mass Index (BMI) is superior to weight alone when assessing the nutrition status in adults. Unfortunately Height, despite being one of the items to measure and record when the client first attends the CTC clinic, in most clients it was not checked. This was particularly true among clients who were not given nutrition supplementation. We were then forced to use weight in the assessment.

Average weight gain was demonstrated, more in the group that was given nutrition supplementation as compared to the no-nutrition group. Average weight gain was not significantly shown probably because the nutrient provided was supplements and not adequate quantities of food. People argue that often PLHIV not only need supplementation with minerals and vitamins but need bulky food containing adequate quantities of Carbohydrate, protein and fat.

All clients interviewed linked provision of nutrition supplements to resumption of their health status and less number of attendance to hospital and improved capacity to work. This could be a direct effect of the nutrient supplementation as a decline in levels of trace elements have been shown independent predictors of morbidity and mortality (ISIS report, 20904; Selenium conquers AIDS)

Providing food supplements leads to majority of clients on ARV resuming their house hold chores. Previous studies have shown that livelihoods are diminished when HIV infected adults cannot work and food production decreases (UNAIDS, 1999). Healthy family members particularly women are often forced to stop work to care for sick family members, further reducing income for food and other basic needs.

About a quarter of the interviewed clients had become single household care takers after their spouses died of HIV/AIDS. Nutrient supplementation will help to ensure that there is food security in households by increasing their productivity. Food insecure households struggle to meet ordinary household needs without the added stress of HIV. Their capacity to absorb the costs associated with HIV/AIDS, to enhance nutritional support and participate in community programs is severely affected and many find themselves in a rapid downward economic spiral (Shah 2002).

The policy states clearly the linear relationship between poverty and the risk of acquiring HIV/AIDS. Same is true for food security. Efforts towards fight against HIV/AIDS must address the issue of nutrition. Poor families cannot afford the right quantity and quality of food. Given that findings from this study support the idea that Nutrition supplementation will add up quality of life through raising CD4 count, the practice (nutrition supplementation) could be adopted and implemented by the government and other important stakeholders so as to raise the quality of life among PLHIV.

Some nutrient supplements might be expensive. The cost of one pack of the supplements provided in the intervention was approximately USD 4 per pack. One client utilizes two packs per week. Other supplements could even be more expensive hindering sustainability. Communities need to be supported so that in the context of what is locally available and the current need make right choices and priorities. Some of the micronutrients supplements are available in natural food stuffs. Examples include Potassium which is plenty in ripe bananas and Vitamin C in green, leafy vegetables and citrus fruits.

Food security leading to adequate balanced diet intake will reduce the need for specific nutrition supplementation needed in the long run and consequently reduce costs of care and treatment.

Individuals with higher CD4 counts are less likely to transmit the infection as the higher the CD4 count the lower the viral load. This will assist in reducing the infective potential of PLHIV and add value to the preventive efforts being taken (third goal NACP 2009).

The fourth goal of the second National Multi-Sectoral Strategic Framework on HIV and AIDS (NMSF 2008 -2012) is to improve the quality of life for PLHIV and those affected by HIV and AIDS including orphans and other vulnerable children. The fifth goal is to use relevant and comprehensive evidence provided in a timely manner in HIV-related planning and decision making. Results from this study could be used to review and change policy to include nutrition supplementation in the Care and Treatment of PLHIV as it improves the quality of life for these people and their dependants and it is a cost effective strategy.

Logistical issues may be taken care by following the same distribution system that is used for ARVs. Little addition of workforce will be needed as the same health care providers may be trained to distribute the nutrition supplements. The idea is in line with the broad concept of integrating all Care and Treatment services for PLHIV in the existing healthcare system.

The role of ARVs in reduction of occurrence of opportunistic infections has been shown in several studies (WHO web page on ARV). Both ARVs and nutrition supplements having similar effects to occurrence of opportunistic infections may mean that a longer observation time and a larger sample size is necessary to observe any added value of nutrient supplementation which this study could not show.

Conclusion

Among clients on ARVs, other factors controlled nutrition supplementation results into better treatment outcomes as shown by a significant rise in CD4 counts. This study could not give substantial evidence on the effect of nutrition supplementation to weight gain despite an observed increase of the same. On the same note no difference was shown, of nutrition supplementation to ARV adherence. The incidence of opportunistic infections was the same between the two groups, probably due to a short follow up time, a small sample size and the retrospective nature of the study.

FGDs were suggested methods for data collection: where the results on these? FGDs is not there in the ToR, please advise on this.**Recommendations**

Nutrition supplementation involving micronutrient and vitamins should be considered as an important integral part in the management of PLHIVs. If proper dietary advice is given and families are assisted to access proper quality and quantities of food, in a cost effective and sustainable manner, there will be a longer period before initiation of ARVs and better response when they start taking ARVs. This study has not shown a reduction in occurrence of opportunistic infections. However, the fact that there was a rise in CD4 counts; one expects fewer opportunistic infections in the long run as occurrence of these is determined by the CD4 count level. In turn this will be cost effective as there will be less need for drugs and longer hospital stay.

For sustainability, families may be enabled to run small scale projects. This would involve keeping chicken, goat or pigs to have a source of protein. They could be encouraged to do gardening to make sure they have a constant availability of vegetables and fruits.

A nutritionist could be recruited to be part and parcel of the team providing care to PLWHIVs in the CTC centers. Such a person could be vital in providing professional advice with regard to nutrition after studying the local situation to see what is easily available. An advice on how to prepare meals could have a bearing in the quality of food eaten and make a difference in the care of these clients.

A larger intervention study is advised and at best follow up on actual clients be done instead of retrieving recorded data.

Annex I: Nutrition Information for the e'pap The Original ® food supplement.

Ingredients: Pre cooked maize, Soy, Sorghum, Sugar, Salt, Neotame, Prebiotics, Flavoring, Anti Oxidants with added vitamins and vitamins.

Nutrient	Unit	Quantity added to 100g of powder	RDA for adults and children older than 10yrs	%of the RDA per 100g powder based on RDA for adults and children older than 10years	% of the RDA per 100g powder based on RDA for children between 7 – 10 yrs
Energy	KJ	1556			
Carbohydrates	G	64.00			
Protein	G	12.50			
Moisture	G	5.00			
Total Fat	G	7.00			
Total diet fibre	G	10.00			
Sodium	G	0.60			
Potassium	G	0.45			
Vitamins					
Vitamin A	Mg	1000	1000	100%	142%
Vitamin C	Mg	60	60	100%	133%
Vitamin E	Mg	10	10	100%	142%

Vitamin B5	Mg	0.9	6	15%	18%
Vitamin B3	Mg	9	18	50%	56%
Vitamin B6	Mg	2	2	100%	125%
Vitamin B2	Mg	0.8	16	50%	57%
Vitamin B1	Mg	1.4	1.4	100%	116%
Folic Acid	Mcg	200	200	100%	150%
Biotin	Mcg	15	100	15%	-
Vitamin B12	Mcg	1	1	100%	33%
Vitamin D	Mcg	1	5	20%	-
Minerals					
Calcium	Mg	220	800	27%	27%
Magnesium	Mg	45	300	15%	18%
Zinc	Mg	15	15	100%	150%
Iron	Mg	14	14	100%	140%
Manganese	Mg	0.45	-	-	15%
Copper	Mg	0.3	-	-	-
Selenium	Mcg	200	-	-	100%
Iodine	Mcg	120	150	80%	100%
Vanadium	Mcg	50	-	-	-
Molybdenum	Mcg	30	-	-	-
Chromium	Mcg	30	-	-	15%

Annex II

HDT guideline for individual interviews regarding nutrition supplementation among clients on ARVs

ID NO. _____

1. Age: _____
2. Sex _____
3. Marital Status: _____
4. Number of Children: _____
5. Duration on ARVs: _____Years _____Months
6. What symptoms did you get relief from after commencing Nutrition Supplementation? (Explore):

(a) Body malaise
(b) Cough
(c) Oral thrush
(d) Cutaneous fungal infection
(e) Diarrhoea
(f) Others: _____

7. On average how many times did you go to hospital:
   (a) Before nutrition supplementation _____
   (b) After Nutrition supplementation _____
8. What changes did you experience regarding the following after you started taking nutrition supplements:
   (a) Eating habits _____
   (b) Taking drugs – ARVs _____
9. What changes in your body did you experience after you started taking nutrition supplements?
   _____
   _____
10. What changes did you experience when you stopped taking nutrition supplements?
    _____
    _____
11. What advice can you give/ your thoughts regarding nutrition supplementation
    _____
    _____

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General Comments on the report

Cover page

- Include HDT logo
- Insert margin for cover page
- Consent of the clients obtained?
- Include abbreviations used in the report

Methodology: FGDs used? Where are the results?

Include: constraints to the study

Consent of the clients obtained?

There must be consistence in the use of terms eg **patients** versus **clients**

Where is the comparison with Zanzibar on nutrition? Refer to ToRs?Where are the programmatic implications of the findings? The ToRs require this to be mentioned

FGDs were suggested methods for data collection: where the results on these?

ToRs for reviewing the report

1. The extent at which the report address the ToR: mostly done, and those missing commented in the text
2. Results and interpretation of results: well covered
3. Edit grammar throughout the document: done throughout the text. See track changes
4. Consistency and relevancy of urgency in the discussion: the discussion is well narrated and does indicate some urgency.
5. Relevancy of conclusion and recommendations: commented on see text in the report. Draft abstract recommendations and main report differs