

**ASSESSMENT OF NUTRITIONAL AND HEALTH INTERVENTIONS ON HIV
INFECTED CHILDREN UNDER FIVE YEARS IN MATHARE NORTH
HEALTH CENTRE, NAIROBI**

By

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university or any other award.

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DEDICATION

To my loving mother, Pasalina Lubeka. Your contribution to education for all your children and grandchildren will always be cherished and remembered. God bless you.

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Honour and glory be to the Almighty God for giving me the ability and strength throughout the study period, without which I could not have made it.

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OPERATIONAL DEFINITIONS

Perinatal transmission: Mode of HIV transmission from an infected mother to an infant during pregnancy, at the time of birth or through breastfeeding.

Replacement feeding: Mode of feeding whereby an infant receives no breast milk but is given a diet that provides all nutrients until the age at which he/she can be fully fed on family foods.

Growth failure: Refers to a child who is failing to grow as expected for age or who is losing weight. He or she can be classified as stunted, underweight or wasting.

Health status: presence and type of illness.

Undernutrition: food intake of insufficient quantity or quality to meet nutritional needs for growth and development

Nutritional status: z scores in relation to NCHS.

Nutritional Interventions: include nutrition counseling, vitamin A supplements and food-by -prescription.

Health interventions: include: Immunization, prophylaxis and ART.

ACRONYMS/ ABBREVIATION.

AFASS	Acceptable, feasible, affordable, sustainable and safe
AIDS	Acquired Immune Deficiency Syndrome
ARI	Acute respiratory infection
ART	Antiretroviral therapy
ARV	Antiretroviral
BCC	Behavior change communication
CBW	Community based workers
CCC	Comprehensive Care Clinic
CHWs	Community health workers
CD ₄	Cluster of differentiation 4
DNA	Deoxyribonucleic acid
DPT	Diphtheria–Tetanus–Pertussis
FBO	Faith-Based Organization
HBC	Home-based care
HIV	Human Immunodeficiency Virus
HHS	Health and Human Services
KEPI	Kenya Expanded Programme of immunization
IMCI	Integrated management of childhood illness
MDG	Millennium Development Goal
MOH	Ministry of Health
MUAC	Mid-upper arm circumference
MTCT	Mother-to-child transmission

NACC	National AIDS Control Council
NASCOP	National AIDS and STI Control Programme
NGO	Non-governmental organisation
OGAC	Office of the Global AIDS Coordinator
OIs	Opportunistic Infections
OVCs	Orphans and Vulnerable Children
PCR	Polymerase Chain Reaction
PCP	Pneumocystis pneumonia
PEPFAR	The President's Emergency Plan for AIDS Relief
PLWHA	People Living With HIV and AIDS
PMTCT	Prevention of mother –to – child transmission of HIV
RDA	Recommended daily allowance
RNA	Ribonucleic acid
STI	Sexually transmitted infection
SPSS	Statistical Package for Social Sciences
UNAIDS	United Nations Special Programme on AIDS
UNICEF	United Nations Children’s Fund
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USG	US Government
VCT	Voluntary counselling and testing
WHO	World Health Organization

ABSTRACT

About 33.4 million people were living with HIV as of 2008 globally; 2.1 million of them were children under 15 years, and about 15.7 million were women. In certain parts of the world, HIV infection has significantly affected child survival. The World Health Report 2005 estimated that HIV infection contributed 3% to the global mortality among children younger than 5 years of age in 2005. According to UNAIDS and WHO 2004, there were more than 1.3 million people infected with HIV and AIDS in Kenya; and more than 100,000 children below the age of 15 years. In the recent years, growth, nutrition and metabolism of HIV infected children have received increased attention, as it has been recognized that HIV infected children generally do not grow as well as their uninfected counterparts. According to the 2005-2010 Kenyan National HIV/AIDS Strategic Plan, the government identified good nutrition as a key component of the national response to the HIV/AIDS epidemic. This study therefore sought to establish the effectiveness of nutritional and health interventions on the health and nutritional status of HIV infected children in Mathare. Respondents to the study included mothers of HIV positive children under five years seeking medical care at Mathare health centre, as well as staff offering services to the caregivers. The objectives of the study were to establish the socio-demographic and socio-economic status among care-givers of HIV infected children, identify nutrition and health interventions in place at Mathare health centre and the proportion of population accessing these interventions, determine the nutrition and health status of the HIV infected children attending clinic at Mathare health centre, assess the relationship between health and nutrition interventions, health status and nutrition status. Data was collected using a structured questionnaire administered on mothers and staff at the facility. These were then entered and analysed by Statistical Package for Social Sciences version 12.0. Descriptive statistics used to summarize the sample population included percentages, frequency distributions and charts. Chi-square was used to determine the relationship between categorical variables namely up-take of health and nutrition interventions versus nutrition status and presence of illnesses. From the study findings, marital status, mother's education and income level were the main factors that influenced access to interventions. The interventions at Mathare health centre include: nutritional counselling, micro-nutrient supplementation, food by prescription, immunization, ART and provision of prophylaxis. Twenty two percent of children in the study were stunted, eleven percent wasted while nineteen percent of the children were underweight. The most frequent illnesses and symptoms in the area were diarrhoea (38%), loss of appetite (29%), cold (28%) followed by cough and fever respectively. There was a significant relationship between nutritional counselling and nutrition status of children, there was also a relationship between food by prescription and nutrition status. Up-take of prophylaxis and ART showed a significant relationship with presence of illness but not with nutrition status. There was significant relationship between nutritional counselling and nutrition status. Nutritional counselling is cheap compared to provision of ART and therefore it can be extended that all children may receive as it is cheap yet it has shown to be effective.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study problem

About 33.4 million people were living with HIV as of 2008 globally; 2.1 million of them were children under 15 years, and about 15.7 million were women. Every day, over 7,400 people become infected with HIV and about 5,500 people die from AIDS, mostly because of inadequate access to HIV prevention care and treatment services. Globally, AIDS-related illnesses remain one of the leading causes of death and are projected to continue as a significant global cause of premature mortality in the coming decades. Sub-Saharan Africa remains the region most greatly affected by HIV, with southern Africa remaining the area most heavily affected by the epidemic. In 2008, sub-Saharan Africa accounted for 67 per cent of HIV infections worldwide, 68 per cent of new HIV infections among adults and 91 per cent of new HIV infections among children. The region also accounted for 72 per cent of the world's AIDS-related deaths in 2008 (UNAIDS and WHO, 2009).

The number of children who have HIV continues to grow. Recent estimates from UNAIDS suggest that globally about 2.0 million children younger than 15 years of age have HIV, about 90% of whom live in sub-Saharan Africa. In 2007 alone, an estimated 370,000 children were newly infected with HIV, mainly through mother-to-child transmission. Sub-Saharan Africa remains the region most affected, followed by Asia (WHO and UNAIDS, 2008). Almost all of these infections in infants could be avoided by timely delivery of known effective interventions to prevent mother-to-child transmission.

In certain parts of the world, HIV infection has significantly affected child survival. The World Health Report 2005 estimated that HIV infection contributed 3% to the global mortality among children younger than 5 years of age in 2005 (WHO, 2005). The proportion of mortality among children younger than 5 years of age attributable to HIV was about 7% in Africa as a whole but was estimated to exceed 50% in some of the most severely affected countries (WHO, 2008). The mortality rate of children born to seropositive mothers is higher than that of children of seronegative mothers and the incidence of prematurity and intrauterine growth retardation are also higher, irrespective of infant HIV infection status (Taha *et al.*, 1995). In addition, women with more advanced HIV infection are not only more likely to transmit HIV to their infants than women with less advanced HIV, but their infected infants are more likely to die by 6 months of age (Zijenah *et al.*, 2004).

According to UNAIDS and WHO 2004, there were more than 1.3 million people infected with HIV and AIDS in Kenya; and more than 100,000 children below the age of 15 years. Over 60% of those infected live in the rural areas where the socio-economic conditions are worsening due to poverty and unemployment. This has strained the already inadequate and ill-equipped health facilities with over 50% of public hospital beds being occupied by patients with HIV and AIDS related infections. It is estimated that many more persons living with HIV and AIDS stay at home unable to access healthcare and stressing the households' ability to cope (GOK, 2005).

In the recent years, growth, nutrition and metabolism of HIV infected children have received increased attention for several reasons. It has been recognized for the past

decade that HIV infected children generally do not grow as well as their uninfected counterparts, but more recent evidence suggests that this is often true even in the face of adequate virologic control, given also that growth is a predictor of survival, there has been closer scrutiny of nutritional and metabolic factors that can contribute to poor growth (Steven and Jennifer, 2006).

The World Health Organization recommends priority health sector interventions for HIV and AIDS that are needed to achieve universal access to HIV prevention, treatment and care. Interventions to prevent illness include chemoprophylaxis against common opportunistic infections; measures to reduce the incidence of pneumonia, diarrhoea and other conditions that are more common or more serious in children or adults with HIV; screening to detect common malignancies and other co-morbidities and immunization. Children and adults with HIV have increased energy needs. They should therefore receive one recommended daily allowance (RDA) of micronutrients, regardless of their HIV status. This is best provided by food, including fortified food. Where the micronutrient content of the daily diet is inadequate, a daily multi-micronutrient supplement is required (one RDA is recommended) (WHO, 2009).

Infant and young child nutrition and health interventions for HIV-exposed and infected children include counseling on feeding options and support for safer breastfeeding or replacement feeding, per WHO or Ministry of health and sanitation protocols. Food rations and therapeutic foods may also be provided depending on local circumstances such as food availability, diet quality, and malnutrition rates. Vitamin A supplementation

is recommended. Provision of prophylaxis as recommended by the Ministry of health that all infants who are HIV-infected or born to HIV-infected women should receive prophylaxis with cotrimoxazole from 6 weeks to 1 year of age or until it is established that the child is not HIV infected and treatment by ART therapy if the diagnosis of HIV has been confirmed and if they have advanced HIV disease according to either clinical or laboratory criteria.

The US government - wide approach for addressing food and nutrition needs of PLWHA receiving treatment and care recognizes that this is too large and complex a problem for any one agency to handle on its own, consequently the OGAC is partnering with other USG agencies, including the USAID, the USDA, the HHS, and the Peace Corps, as well as relevant UN agencies and the private sector to leverage resources to carry out supplementary feeding, micronutrient supplementation, as well as food security and livelihood support. Through partnerships, PEPFAR addresses the needs of HIV-affected communities, especially affected families and care-givers of PLWHA. Furthermore, PEPFAR have strengthened coordination at the country level in order to facilitate the implementation of these programmes and to improve monitoring and evaluation (USGC, 2006).

The National AIDS Control Council, in collaboration with various partners, has established a framework for the National Nutrition Intervention in the fight against HIV and AIDS to coordinate the response in the fight against HIV and AIDS, from the national to the community level. This framework is to help harmonize nutrition

interventions within the continuum of care and support services for PLWHA. Various tools have been put in place to assist in counselling PLWHA on how to improve their nutritional status and promote quality life. These include the Kenyan National Guidelines on Nutrition and HIV and AIDS, Flipchart, Take-home Flyers and Counselling Cards (NAS COP, 2006)

1.2 Problem Statement

In 2007, an estimated 2 million children and 13 million women of childbearing age worldwide were infected with HIV (UNAIDS, 2008). The HIV epidemic in children continues to grow, partly because only about 33% of HIV-infected pregnant women receive antiretroviral therapy (ART) for the prevention of mother-to-child transmission (PMTCT) (UNAIDS, 2008). HIV infection follows a more aggressive course among infants and children than among adults, with 30% dying by age 1 year and 50% by age 2 years without access to life-saving drugs, including antiretroviral therapy and preventive interventions such as co-trimoxazole (trimethoprim-sulfamethoxazole) (Newell *et al.*, 2004). The World Health Report 2005 estimated that HIV infection contributed 3% to the global mortality among children younger than 5 years of age in 2005 (WHO, 2005). The proportion of mortality among children younger than 5 years of age attributable to HIV was about 7% in Africa as a whole but was estimated to exceed 50% in some of the most severely affected countries (WHO, 2008). Women with more advanced HIV infection are not only more likely to transmit HIV to their infants than women with less advanced HIV, but their infected infants are more likely to die by 6 months of age (Zijenah *et al.*, 2004).

One of the key observations in Kenya's demographic history has been the rapid decline in infant and child mortality in the 1970s and early 1980s, and an upsurge in the nineties (GOK, 2005). The expected target for the achievement of the MDG goals are to reduce by two thirds, between 1990 and 2015, the under five mortality rate, which translates to reducing from 99/1000 in 1990 to 33/1000 in 2015, despite the fact that the rate has since increased to 115/1000 (GOK, 2005).

HIV exposure and infection exacerbates problems of child malnutrition. Children living with HIV or born into families affected by HIV are a high-risk group with special needs. HIV-positive women have a higher incidence of pre-term and low birth weight deliveries, consequently, HIV-exposed infants may start life with impaired nutrition. HIV-positive infants experience slower growth and are at greater risk of severe malnutrition (Coley *et al.*, 2001). Studies from Kenya, Malawi, Rwanda, Côte d'Ivoire and South Africa show much faster disease progression in children, with 26-45% mortality by 1 year of age, 35-59% by 2 years of age and up to 89% by 3 years of age (Mbori-Ngacha *et al.*, 2001).

In this era of potent antiretroviral therapy (ART), malnutrition has been recognized as a significant problem and correlates directly to mortality for HIV patients. Nutritional deficiencies in people living with HIV and AIDS begin early and often go unrecognized. Therefore, optimizing nutritional status is key objective in comprehensive management of HIV clients. Placing patients on antiretroviral therapy is in fact, related to improved nutritional status (USAID and SARA *et al.*, 2009).

1.3 Justification

This study is important as it assesses the effectiveness of the interventions put in place for HIV infected children. Every year, enormous government resources are being channelled towards programmes that are meant to assist HIV infected people, these resources are often scarce, hence the need to ensure that the desired results are being achieved, thereby minimizing wastage.

Many guidelines and recommendation on treatment and nutrition interventions have been published together with aids to convey information to patients. The results of these programmes need to be documented to ensure that the target population has been reached. This study therefore sought to document these to enable policy makers to utilize the information to strengthen the interventions and customize them depending on the targeted regions countrywide.

According to the 2005-2010 Kenyan National HIV/AIDS Strategic Plan, the government identified good nutrition as a key component of the national response to the HIV/AIDS epidemic. This was in keeping with global recognition that good nutrition is essential for the promotion of health and quality of life of all people, particularly for PLWHA (NACC, 2005).

The World Health Organization recommends that children who are HIV infected should receive early and effective treatment of common infections through the integrated management of childhood illnesses approach. Studies show that severe malnutrition in HIV-infected children can be reversed with hospital and home-based therapeutic feeding,

though the time to recovery is longer than with uninfected children (Sandige *et al.*, 2004). Studies also indicate that periodic vitamin A supplementation reduces morbidity and mortality in HIV-infected children and improves their growth (Coutsoudis *et al.*, 1995). Therefore, monitoring of the effectiveness of nutrition and health interventions will provide information on the progress made on the implementation process of the intervention by the government, and steps made towards the achievement of the millennium development goal four of reducing child mortality.

1.4 Purpose of the study

The purpose of the study was to establish the effectiveness of nutritional and health interventions on the health and nutritional status of HIV infected children.

1.5 Objectives

1. Establish the socio- demographic and socio-economic status among caregivers of HIV infected children.
2. Establish the nutrition and health interventions in place at Mathare health centre and the proportion of population accessing these interventions.
3. Determine the nutrition and health status of the HIV infected children attending clinic at Mathare health centre.
4. Assess the relationship between health and nutrition interventions, health status and nutrition status.

1.6 Hypotheses

The Null Hypotheses tested in the study were;

1. H_0 : The socio- demographic and socio-economic status among care-givers does not affect the provision of health and nutrition interventions among HIV infected children.
2. H_0 : The nutrition and health interventions in place at Mathare health centre are not adequate for HIV infected children.
3. H_0 : The nutrition and health status of the HIV infected children attending clinic at Mathare health centre is poor.
4. H_0 : There is no significant relationship between health and nutrition interventions, health and nutrition status among HIV infected children attending Mathare health centre.

1.7 Conceptual Framework

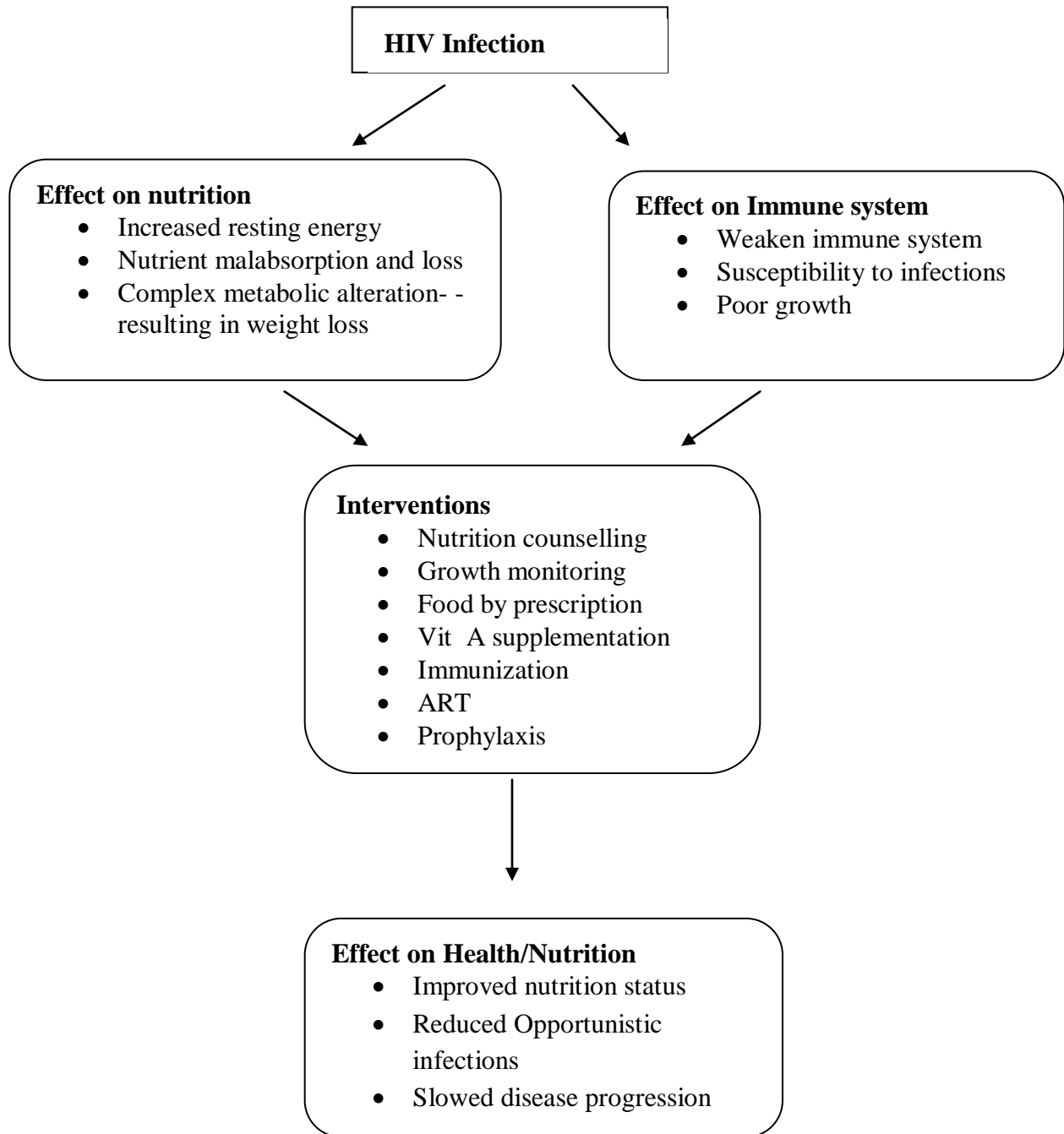


Figure 1.1 Conceptual framework : Effect of Nutrition and Health interventions on HIV Infected Children.

CHAPTER TWO: LITERATURE REVIEW

2.1 Global overview of HIV Infection

About 33.4 million (31.1 million–35.8 million) people were living with HIV worldwide as of 2008; 2.1 million (1.2 million–2.9 million) of them were children under 15 years, and about 15.7 million (14.2 million–17.2 million) were women. Every day, over 7,400 persons become infected with HIV and about 5,500 persons die from AIDS. Globally, AIDS-related illnesses remain one of the leading causes of death and are projected to continue as a significant global cause of premature mortality in the coming decades (UNAIDS and WHO, 2009).

In 2008, an estimated 1.9 million (1.6 million – 2.2 million) people living in sub-Saharan Africa became newly infected with HIV, bringing the total number of people living with HIV to 22.4 million (20.8 million – 24.1 million). While the rate of new HIV infections in sub-Saharan Africa has slowly declined—with the number of new infections in 2008 approximately 25% lower than at the epidemic’s peak in the region in 1995—the number of people living with HIV in sub-Saharan Africa slightly increased in 2008, in part due to increased longevity stemming from improved access to HIV treatment. Adult (15–49 years) HIV prevalence declined from 5.8% (5.5–6.0%) in 2001 to 5.2% (4.9–5.4%) in 2008. In 2008, an estimated 1.4 million (1.1 million–1.7 million) AIDS-related deaths occurred in sub-Saharan Africa. This number represents an 18% decline in annual HIV-related mortality in the region since 2004 (UNAIDS and WHO, 2009).

2.1.1 HIV situation among Kenyan children

Many children are infected perinatally; they contract the infection from their mothers during pregnancy, at the time of birth or through breastfeeding. About 30 to 40% of babies born to infected mothers will themselves be infected. The rest will not be infected but are at risk of becoming orphans when their parents die from AIDS. About 100,000 children in Kenya (under the age of 5) are infected (NASCOP, 2001).

The HIV epidemic in Kenya has resulted in a 30% increase in mortality among infants and young children. This means that 1/3 of all infant deaths can now be attributed to AIDS. Thus the AIDS epidemic is rapidly reversing the gains in child survival accrued through child survival programmes. The disease follows a more rapid course in children than in adults. Human Immunodeficiency Virus-infected children can be divided into those with rapidly progressing disease (children who generally die within the first year of life) and those with slower disease progression (children who survive beyond the first year). Without treatment more than half of all HIV infected children die in the first 3 years of life with a large number of those deaths occurring in the first 6 months. It is therefore crucial to diagnose HIV early to be able to introduce life-prolonging interventions (NASCOP, 2005).

Antiretroviral therapy has proven to be highly effective in children, including for those in resource-poor settings. Rapid initiation of treatment restores and preserves immune functions, promotes normal growth and development and prolongs life. Generally, some 80% of children with HIV die by their fifth birthday if they do not receive antiretroviral

therapy. In high-income countries, where most children with perinatally acquired HIV infection are treated early with antiretroviral therapy, the treatment has been shown to reduce mortality by five-fold or more and results in survival rates of 80% and higher. In Kenya by the end of 2005 only 8% of the children who were HIV infected were on ARVs (WHO and UNAIDS, 2006).

2.1.2 Diagnosis

HIV infection is often difficult to diagnose in very young children. Infected babies, especially in the first few months of life, often appear normal and may exhibit no signs that would allow a definitive diagnosis of HIV infection. Moreover, all children born to infected mothers have antibodies to HIV, made by the mother's immune system, that cross the placenta to the baby's bloodstream before birth and persist for up to 18 months. Because these maternal antibodies reflect the mother's but not the infant's infection status, the test is not useful in newborns or young infants. In recent years, investigators have demonstrated the utility of highly accurate blood tests in diagnosing HIV infection in children 6 months of age and younger. One laboratory technique called polymerase chain reaction (PCR) can detect minute quantities of the virus in an infant's blood. Another procedure allows physicians to culture a sample of an infant's blood and test it for the presence of HIV (NIAID, 2001).

Currently, PCR assays or HIV culture techniques can identify at birth about one-third of infants who are truly HIV-infected. With these techniques, approximately 90 percent of HIV-infected infants are identifiable by 2 months of age, and 95 percent by 3 months of age. One innovative new approach to both RNA and DNA PCR testing uses dried blood

spot specimens, which should make it much simpler to gather and store specimens in field settings. There are currently just five laboratories in Kenya capable of carrying out PCR. (WHO and UNAIDS, 2006).

Data from studies in resource-limited settings confirm that, for infants who acquire HIV before or around delivery, disease progression occurs very rapidly in the first few months of life, often leading to death (Kids-ART-Linc Collaboration, 2008). In recent studies in South Africa, up to 80% of infected infants, who were well at 6 weeks, progressed to become eligible to start ART by 6 – 12 months of age (Violari *et al.*, 2008, Mphatswe *et al.*, 2007). Therefore, early determination of HIV exposure and definitive diagnosis is critical to allow early initiation of potentially lifesaving ART (Violari *et al.*, 2008, Prendergast *et al.*, 2008).

2.1.3 Etiology of HIV disease associated growth failure

A number of causal factors suggest that the genesis of growth disturbances in HIV-infected children is multifactorial. Poor growth is often attributable to recognizable illnesses and secondary conditions that accompany HIV infection. Secondary causes of growth faltering or failure, many of which are potentially preventable, reversible or modifiable, are involved. These include dietary insufficiency, diarrhoeal illnesses, and anemia. Poor growth is also encountered in HIV-infected children with no discernible secondary illnesses (that is, much of the variance in growth appears to be independent of HIV infection and suppression of viral replication with ARVs is an important means of enhancing growth) (Stephen, 2005).

2.1.4 HIV, diarrhoea, malabsorption and growth

Gastrointestinal infections, a common cause of childhood malnutrition and growth retardation, also contributes significantly to poor growth in HIV-infected children. Children infected with HIV appear to be especially vulnerable to diarrhoeal diseases. In a longitudinal study of HIV infected children in Kinshasa, Democratic Republic of Congo, it was found that HIV-infected children had increased rates of acute and chronic diarrhoea: 90% of infected children had one or more episodes of acute diarrhoea and chronic diarrhoea was 6 times as likely to develop in HIV-infected children as in uninfected children. Diarrhoea is strongly associated with decreased growth and increased mortality (Keusch *et al.*, 1992). An 11-fold increased risk of death in HIV-infected children in Kinshasha with persistent diarrhoea was reported (Thea *et al.*, 1993).

A study done by Villamor in Tanzania found that during the ages of 6–11 months, the mean growth for HIV-infected infants with one or more episodes of diarrhoea per year was 1.4 cm/year less than those infants with no episode (Villamor *et al.*, 2003). Additional episodes result in further decrease in growth thus in many regions of sub-Saharan Africa, diarrhoeal diseases represent an important and potentially modifiable factor involved in growth disturbances in HIV-infected children. Few studies, however, have evaluated whether the weight loss and growth retardation related to acute and chronic diarrhoea is reversible. Few studies have evaluated means of nutritional support for malnourished HIV-infected children recovering from acute diarrhoea. This question has implications for treatment guidelines now being widely adapted throughout the

nations of sub-Saharan Africa, many of which call for initiation of ARVs for children meeting WHO HIV Stage III criteria.

Although data are not available, it is anticipated that attained weight for age of less than 60% will be among the most common findings among children meeting criteria for initiation of ARVs. Some children who otherwise are without HIV-related illnesses or reduced CD4+ counts may benefit from nutritional rehabilitation; ARVs can be deferred for these children (Steven, 2005).

2.2 Nutrition status in Kenya

Malnutrition is one of the most important health and welfare problems facing Kenya today and afflicts the most vulnerable groups: women and children. About 31% of children under five years old are stunted and about 20% are underweight. Rates of underweight and stunting are approximately 10% higher in rural areas than in urban areas. In addition, anaemia affects three out of every four children under five years; one out of every two women of reproductive age; and one man out of every five men. About half of Kenyan children under five years old, and of women of reproductive age, are also at high risk of zinc deficiency. Vitamin A deficiency remains prevalent among children and women in general, and among specific sub-groups of men. Vitamin A, zinc and iron deficiencies underlie widespread multiple micronutrient deficiencies that constitute significant public health problems. It is estimated that over 23,000 deaths of children are related to increased susceptibility to infections related to vitamin A deficiency, and that approximately 70% of children in Kenya grow up with lowered immunity. Overall, the nutritional situation of the Kenyan population remains precarious (NAS COP, 2006)

2.3 Nutrition HIV and AIDS

Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome and malnutrition are both highly prevalent in many parts of the world, especially in sub-Saharan Africa. Their effects are interrelated and exacerbate one another in a vicious cycle. Both HIV and malnutrition can independently cause progressive damage to the immune system and increased susceptibility to infection, morbidity and mortality through opportunistic infections, fever, diarrhea, loss of appetite, nutrient malabsorption, and weight loss (Piwoz *et al.*, 2004). HIV specifically affects nutritional status by increasing energy requirements, reducing food intake, and adversely affecting nutrient absorption and metabolism, the relationship between nutrition and HIV/AIDS is a vicious cycle (USGC, 2006).

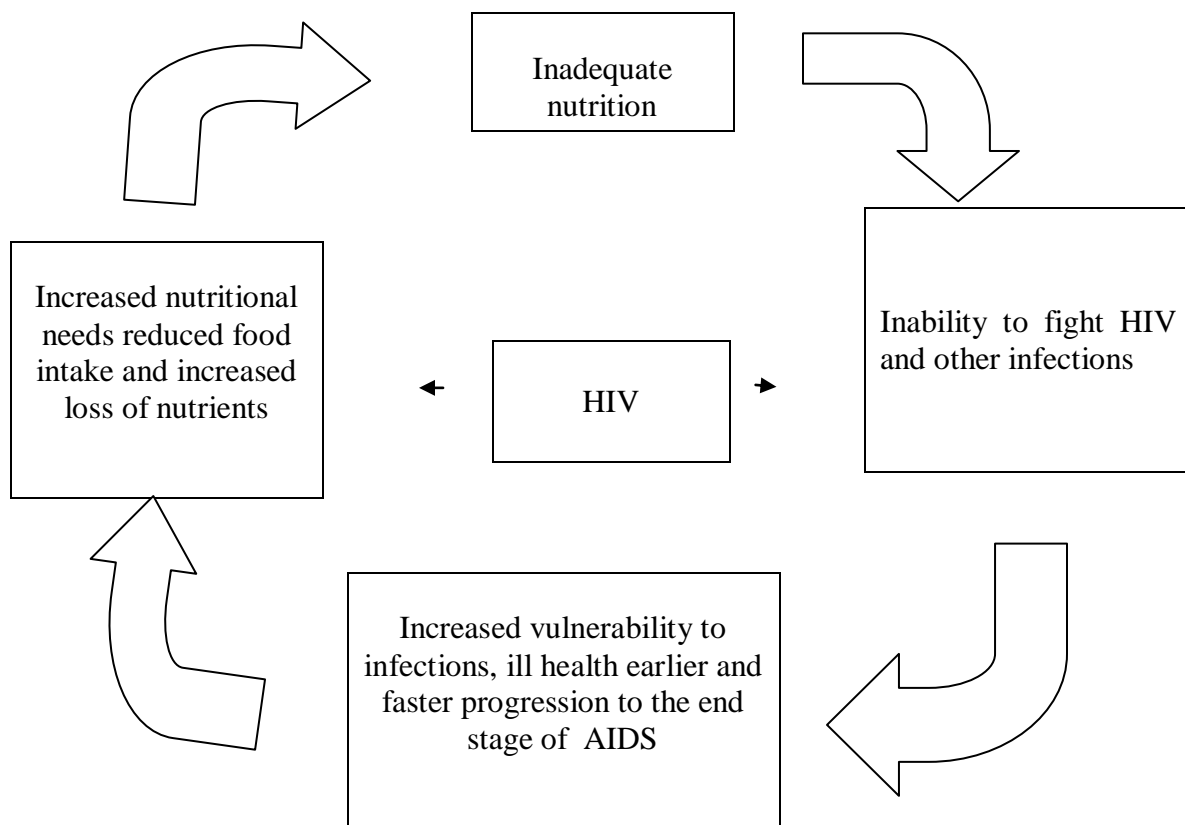


Figure 2.1: The cycle of malnutrition and infection in the context of HIV/AIDS (NASCO, 2006)

2.3.1 The link between HIV and nutrition

Adverse nutritional outcomes, such as abnormalities in growth and metabolism, are common in children infected with HIV and can be major contributors to both morbidity and mortality. The association between HIV infection and low weight-for-age or growth faltering in HIV-infected children has been reported in both resource-rich and resource-poor settings. In adults, the nutritional consequences of HIV were also among the first to be recognized and reported. These interactions have particular relevance for children living with HIV because of the significant geographical overlap between regions with a high HIV prevalence and areas where food insecurity and moderate and severe malnutrition are common. In HIV-uninfected children, the relationship between protein-energy malnutrition, micronutrient deficiency and adverse effects on the immune system has been recognized for many years (WHO, 2003). The ability of HIV to cause profound anorexia and wasting further complicates the situation, especially where resources are not available to thoroughly investigate children to determine whether the primary cause of wasting is HIV infection or food insufficiency or other infections.

2.3.2 The relationship between poor growth and survival of children living with HIV

Poor growth in HIV-infected children may have many causes. It can be attributed to reduced food intake due to socioeconomic circumstances or altered care-giving practices such as when the mother herself is unwell. Opportunistic infections and their effect on food intake, absorption and metabolism can cause weight loss, which is sometimes very rapid. However, even when children are otherwise asymptomatic, HIV infection and the metabolic disturbances that it can induce may result in poor linear growth and weight

gain (Chandra *et al.*, 1994). The poor nutritional status of children living with HIV, including those who have already started ART, is closely associated with their likelihood of dying. HIV-infected children who are significantly underweight are much more likely to die than those who are not malnourished (Callen *et al.*, 2009). Similar findings have been described in adults living with HIV, including adults receiving ART. Given the important relationship between HIV, nutrition, growth and survival of children living with HIV, WHO recommends that nutritional assessment and support be an integral part of the care plan of an HIV-infected infant or child, irrespective of whether the child is on ART (WHO 2009).

The negative effects of HIV infection on postnatal growth have been consistently observed and well documented in studies performed in both industrialized and developing countries. Disturbances in growth are detectable well before the onset of opportunistic infections or other manifestations. Growth faltering by age 3–4 months was observed in studies performed in the United States and Europe. In the United States, where adequate sources of nutrition are readily accessible, somatic growth is also a sensitive indicator of prognosis during treatment with ARVs (Carey, 1998).

Recently, it was determined that statural growth velocity (height-for-age Z-score) was the growth index most closely associated with clinical progression, immune reconstitution and declines in viral replication among U.S. children receiving potent ARV therapies (Benjamin *et al.*, 2003). Height and weight impairment increases with age, it

was observed that HIV-infected children were 0.7 kg lighter and 2.2 cm shorter than children 18 months of age exposed to but not infected with HIV (Moye *et al.*, 1996).

Sub-Saharan African children with HIV also have growth retardation early in life. An effect on length for age and weight for age by age 3 months compared with values for seroreverters was reported in a South African urban cohort (Bobat *et al.*, 2001). In some studies among sub-Saharan African children, wasting (e.g., disproportionate effect on weight versus height) becomes prominent after 1 year (Bailey *et al.*, 1999). Nonetheless, although the effect on weight is disproportional, effect on length is still severe in this cohort—50% with length-for-age Z-score below -2 SD by 1 year. Data for beyond age 4 years are more limited but an average weight deficit of 7 kg and height deficit of 7.5 cm by age 10 years was reported (The European Collaborative Study, 2003).

Progressive stunting (that is, proportionately decreased statural and ponderal growth) is more typical than wasting (disproportionate decrease in weight for length) in postnatal growth. Only a single study reports growth beyond two years in sub-Saharan African children in which the HIV effects on growth are diminished compared with earlier in life (Lepage *et al.*, 1996). This finding may reflect the early mortality of the most severely affected.

The relationship between micronutrient status, morbidity and mortality among HIV infected and uninfected children may be different in resource poor settings, where deficiencies are more common or severe for example perinatally HIV exposed infants in Malawi were more likely to have growth failure or die when their mothers had low

plasma Vitamin A concentration, but a study in the US revealed no association in the general population between Vitamin A status and childhood growth or mortality (Steven and Jennifer, 2006).

Early studies demonstrated that weight loss and wasting were associated with increased risk of opportunistic infections and shorter survival time in HIV-positive adults, independent of their immune status. Other studies showed that clinical outcome was poorer and risk of death was higher in HIV-positive adults with compromised micronutrient intake or status. Micronutrient deficiencies may contribute to disease progression. 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 infection, are common in people living with HIV. Deficiencies of anti-oxidant vitamins and minerals contribute to oxidative stress, a condition that may accelerate immune cell death and increase the rate of HIV replication (Piwoz *et al.*, 2004).

HIV infection may alter presentation of malnutrition in resource- poor settings. Zambian children who were HIV seropositive had lower weight –for –age scores than their sero negative counter parts; but were also more likely to have Marasmus compared with seronegative children, who were more likely to have Kwashiorkor. Marasmus was associated with higher mortality (Steven and Jennifer, 2006).

Daily micronutrient (antioxidant) supplementation improved body weight and body cell mass; reduced HIV RNA levels; improved CD4 cell counts; and reduced the incidence of

opportunistic infections in small studies of adults with AIDS, including those on antiretroviral therapy. 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 nutritionally vulnerable women with more advanced HIV disease.

2.4 Studies of energy balance and viral replication

Under-nutrition appears to play an important role in HIV-associated growth failure (Hsu *et al.*, 2005). Even in settings where food sources are adequate and readily accessible, dietary intake is lower in HIV infected children than HIV-negative control children (Jahoor, 2003). In addition HIV-infected children with growth failure have lower intake than do HIV-infected children with normal growth (Arpadi *et al.*, 2000). Anorexia or comorbid conditions that impede food intake, such as oral candidiasis, are presumed to cause this lower intake. In contrast to some studies of HIV-positive adults, no increases in basal metabolic rate were reported in HIV-infected children in the absence of secondary infections (Arpadi *et al.*, 2000).

Nonetheless energy balance studies performed in U.S. children found energy deficits in children with HIV associated growth (Arpadi *et al.*, 2000), suggesting that dietary intake for children with growth failure is not sufficient to meet metabolic demands and sustain normal growth. In contrast, children with normal growth were found to have an energy surplus (Arpadi *et al.*, 2000). A deficiency in dietary intake, however, is unlikely the sole source of growth failure in these children. Several studies performed before potent ARVs were available showed that increasing the nutritional intake in children with HIV-

associated growth failure with supplemental enteral and tube feedings improves weight but does not affect linear growth or lean body mass (that is, arm muscle mass) (Henderson *et al.*, 1994). Results from multiple regression analysis indicate that once viral load is considered, dietary intake accounts for little of the variance in growth. Dietary intake also varies inversely with level of virus, suggesting that viral replication directly or indirectly suppresses appetite (Pollack *et al.*, 1997).

Nutritional care and support assists to break this vicious cycle by helping individuals improve, maintain or slow the decline of nutritional status; manage symptoms; boost immune response; and improve adherence and response to antiretroviral therapy and other medical treatment.

2.5 Infant feeding option

Optimal infant and young child feeding practices are crucial in the context of HIV and AIDS. Breastfeeding practices may also affect the health of HIV-exposed children. The rate of HIV infection in breastfed infants is cumulative and increases with duration of breastfeeding; an individual patient meta-analysis estimated that the cumulative probability of late postnatal transmission between 4 weeks and 18 months of age was 9.3%. Furthermore, approximately 42% of all HIV infections were attributable to breastfeeding. Mixed feeding doubles the risk of HIV transmission (Coovadia, 2006, Iliff, 2005, Coutsoydis, 2005, Leroy, 2005).

Advances in research on infant feeding show no significant difference in HIV free survival from replacement feeding for HIV exposed infants and those HIV exposed and

exclusive breastfed with ART treatment. However, significant increase in child mortality has been noted for infants on replacement feeding (Coovadia, 2006, Nduati, 2000). WHO (2000) review of studies in developing countries in populations with a low HIV prevalence found that infants who are not breastfed and receive formula milk or other replacement feeding have a six fold increased risk of dying in the first 2 months of life, a fourfold increase between 2 and 3 months, and a 2.5-fold increase between 4 and 5 months compared with those who are breastfed (Jackson, 2008).

Exclusive breastfeeding up to 6 months and continued breastfeeding up to one year of age with introduction of complementary foods after 6 months is therefore recommended for children exposed to HIV. During this period, both the mother and baby are covered with antiretroviral therapy to minimize mother to child transmission according to 2009 WHO recommendations and national standards of care for PMTCT. Mothers opting not to breastfeed should meet the AFASS criteria for replacement feeding (WHO, 2009).

2.6 Essential interventions for infants and children who are HIVinfected or exposed to HIV

A first critical step for countries is to define their essential package of child health interventions, which includes HIV prevention, diagnosis, care and treatment. Child health interventions must also include preventive measures that may reduce the likelihood of exposure leading to disease. This component of the package is particularly important for children who are exposed to or have HIV, who are already more susceptible to childhood illness. In addition, the following interventions are required for the children who are exposed to or have HIV: antiretroviral prophylaxis for mother and infant; early and

regular clinical assessment; provider-initiated HIV testing, including laboratory tests for HIV in infants; counselling and support for optimizing nutrition and infant and young child feeding; co-trimoxazole preventive treatment; screening, prevention (including isoniazid prophylaxis) and management of TB; early antiretroviral therapy; treatment adherence support; regular clinical and laboratory monitoring; psychosocial support and care, treatment and support for their family members.(WHO and UNICEF, 2008)

In September 2005, 191 United Nations member states endorsed the universal access goal at the high-level plenary meeting of the 60th session of the United Nations General Assembly. ‘Universal Access’ means establishing an environment in which HIV prevention, treatment, care and support interventions are available, accessible and affordable to all who need them. It covers a wide range of interventions that are aimed at individuals, households, communities and countries (WHO,2009).

2.7 Health interventions

2.7.1 Immunization

Immunization is one of the easiest ways to prevent dangerous diseases. Immunizations can also help human immunodeficiency virus (HIV)–infected children, who are more likely to acquire preventable diseases because of a compromised immune system. Appropriate immunizations vary by geographic location. There is limited information regarding routine immunization of HIV-infected children, but with some notable exceptions, immunization is generally safe and beneficial for HIV-infected patients (Carina, 2009). Significant progress has been achieved by the Global Bureau, Regional Bureau and USAID field programs worldwide. In most

developing countries, immunization coverage (DPT3) has increased from roughly 30% to an estimated 83%. The result of these achievements is an estimated 4.7 million children's lives saved annually

Medical records shows that Pneumonia is among the top three causes of hospital admissions and among the top five causes of infant and under five mortality in Kenya. The Kenya government adopted the Integrated Management of Childhood Illness in 1998. However implementation began much later, in November 2000. The aim is to achieve a level of 60% of health workers trained. The strategy's core interventions are integrated management of the five infections namely: acute respiratory infections (ARI), Diarrhoea, Measles, Malaria and Malnutrition as well as Anaemia. During the past five years substantial progress has been made in the development of IMCI.

2.7.2 Co-trimoxale

Co-trimoxazole is a combination of two antibiotics – sulfamethoxazole and trimethoprim. It is widely available in a number of forms and is known by several brand names. The most common use of cotrimoxazole is for the first-line management of acute respiratory infections (ARI) in children, but it is also used to treat diarrhoea and Pneumocystis jiroveci pneumonia (PCP). The widely available antibiotic co-trimoxazole is an important preventive element of HIV care and is recommended for the prevention of Opportunistic infections, notably Pneumocystis jiroveci pneumonia (PCP), and its use for this indication is referred to as co-trimoxazole prophylaxis. Despite the existence of national policies for co-trimoxazole prophylaxis and the fact that it is inexpensive, lifesaving, widely available, safe and theoretically easy to deliver, the United Nations Children's

Fund (UNICEF), WHO and partners estimate that in 2008, only about 8% of children exposed to HIV were initiated on co-trimoxazole prophylaxis by two months of age (UNAIDS, WHO, UNICEF, 2009). A randomized controlled trial among HIV-infected children in Zambia demonstrated that mortality was reduced by half and the number of hospital admissions was significantly reduced among children using co-trimoxazole (Chintu *et al.*, 2004).

The Ministry of Health recommends that everyone diagnosed with HIV take Cotrimoxazole an antibiotic that reduces the risk of early mortality by 25-46%, as well as rates of hospitalization from Malaria, Diarrhoea and Pneumonia. All infants of HIV infected women should receive prophylaxis with Cotrimoxazole from six weeks to one year or until established that the child is not HIV infected. Prophylaxis is strongly recommended as standard care and should be continued over one year, the children with a rapidly falling CD4 Lymphocytes count should also be considered.

The guide treatment of paediatric HIV infection are the same as for any HIV-infected person, there are a number of unique scientific and medical concerns that are important to consider in the treatment of children with HIV infection. These range from differences from adults in age-related issues such as CD4 lymphocyte counts and drug metabolism to requirements for special formulations and treatment regimens that are appropriate for infants through adolescents. As in adults, treatment of HIV-infected children today is a complex task of using potent combinations of antiretroviral agents to maximally suppress viral replication.

2.7.3 Anti-Retroviral Therapy

Anti-Retroviral Therapy is the most effective intervention for prolonging survival in people with HIV. When taken regularly, ART is associated with a 90% reduction in mortality. Current guidelines from the Ministry of Health recommend ART for all HIV-infected adults with CD4 cell count less than 250 cells/ μ L, for adults with WHO stage three disease with CD4 cell counts less than 350 cells/ μ L, and for adults with WHO stage four disease regardless of CD4 cell count.

ART therapy in children is part of the comprehensive HIV care that prolongs survival and promotes quality of life. Children on ART therapy thrive better and are subject to fewer opportunistic infections than those who are not treated. Children should start on ART therapy if the diagnosis of HIV has been confirmed and they have advanced HIV disease according to either clinical or laboratory criteria.

Although current estimates of coverage of antiretroviral therapy for children are close to those of adults (WHO, UNICEF, UNAIDS, 2009), the provision of antiretroviral therapy to children has specific challenges, including the faster progression to AIDS and death, the difficulty of diagnosing HIV in children and the challenges in developing affordable and appropriate antiretroviral regimens for children (UNAIDS, 2008). Advances in several components of HIV treatment for children are now being reflected in epidemiological data. Use of simplified assays on dried blood spots now offers a feasible, cost-effective means of diagnosing HIV in infants and young children (Ou *et al.*, 2007). Early diagnosis and early antiretroviral therapy were found to reduce infant mortality by

76% and to slow HIV-related disease progression by 75% in two medical centres in South Africa (Violari *et al.*, 2008). In Zambia, antiretroviral therapy and once-daily cotrimoxazole prophylaxis reduced mortality among HIV-infected children by six fold, yielding results comparable with those recorded in high-income settings (Walker *et al.*, 2007). However, even with the impressive medical outcomes achieved through diagnosis and treatment, mortality within the first months of therapy remains high for HIV-infected children in sub-Saharan Africa (Bolton-Moore *et al.*, 2007; Bong *et al.*, 2007).

2.7.3.1 Effect of ARVs on growth

Studies of the effect of potent multiclass ARV regimens in reversing height deficits and body composition abnormalities are becoming available; results, although generally favourable, are mixed. Treatment with ARV regimens containing protease inhibitors significantly affected weight and weight-for-height ratio and had a marginal effect on height (Italian Pediatric Intestinal/ HIV Study Group, 1993). Conversely, two studies found no overall improvement in growth in children receiving ARVs containing protease inhibitors despite improvements in viral load (Nachman *et al.*, 2002). Children with a very high entry viral load (e.g., >200 RNA copies/cc³) who subsequently experienced a decline of more than 2.0 log had an improved height-for-age (Z-score) (Verweel, 2002).

A potentially important issue in studies of this nature is whether HIV treatments, many of which have significant gastrointestinal toxicities (e.g., nausea, vomiting, diarrhoea), negatively affect appetite and dietary intake, resulting in a blunting of growth improvement potentially achieved through viral suppression, which was accounted by one study through measurement of dietary intake (Miller, 2001).

2.8 Nutritional interventions

2.8.1 Nutritional counselling and Education

Nutritional counselling and education is done to support weight gain or maintenance; prevent and manage food- and waterborne illnesses; manage dietary complications related to HIV infection and anti-retroviral treatment; promote safe infant and young child feeding practices, including promotion of early and exclusive breast feeding for HIV exposed infants in all situations where safe conditions cannot be guaranteed for replacement feeding to reduce MTCT, and protect the health and survival of OVCs.

This approach includes support for training health care personnel to ensure incorporation of current technical best practice into counselling and service delivery. Currently, nutritionists/dietitians are posted to comprehensive care clinics (CCCs) in provincial and district hospitals, where HIV/AIDS treatment and care is provided. Health officials have established systems whereby ART patients and other PLWHA receiving services meet with nutritionists for nutritional assessment and counselling. Patient weight records are maintained and used to support counseling (Piwoz *et al.*, 2004).

The interventions specific objectives include: improving the quantity and quality of diets among PLWHA; building or replenishing body stores of essential nutrients; preventing or stabilizing weight loss; preserving and gaining muscle mass; preventing diarrhoea and other infections that impact on nutritional status; speeding recuperation from HIV-related infections; and preparing for and managing AIDS-related symptoms that affect food consumption and dietary intake (Piwoz *et al.*, 2004). Some researchers have documented

a significant relationship between nutrition knowledge and nutrition behaviour [Kanani, 1997, Kapur, 2003]. Comparison of the mean knowledge score of mothers before and after the intervention indicated the beneficial effect of the educational sessions. A community-based study in Delhi including a nutrition education of four months where mothers showed significantly higher nutrition knowledge and the dietary iron intake of children was significantly higher than their control group counterparts thus illustrating the importance of nutrition counselling [Kapur, 2003].

2.8.2 Nutritional Monitoring

Routine monitoring of the growth of pediatric patients is recommended so as to detect any growth faltering and begin supportive action before a child becomes malnourished. Any child who has experienced poor growth (compared to standard reference curves), is having trouble eating, or has lost weight since a previous clinic or home visit is in need of additional care. Since weight and growth both accurately reflect disease progression, monitoring weight and growth is an inexpensive and valuable tool for determining nutritional status that can be used in virtually any setting. In many programs in developing countries, children under 2 years of age are being targeted for frequent growth monitoring because this is the period when malnutrition typically occurs. WHO recommends focusing on this period between birth and 2 years of age to ensure adequate nutrition and prevent malnutrition (WHO, 2008).

The World Health Organization also recommends that HIV-positive children up to 14 years of age have their growth and nutritional status monitored at least every three to six

months (WHO, 2007). It is standard practice in most countries to promote monthly growth monitoring for all infants and young children from birth to 2 years of age; this level of routine follow-up is even more critical for infants and young children living with HIV. To prevent growth faltering, monthly monitoring of weight gain in children is ideal. Monitoring weight does not prevent growth faltering but assists in early detection and management.

Routine pediatric care of the HIV exposed and infected children must be delivered by a primary care provider who is knowledgeable in this chronic disease. Coordination of medical subspecialties and psychosocial services is needed to deliver optimal routine care (Steven and Jennifer, 2006).

2.8.3 Assessment of Nutritional Status

All HIV-positive children should have their nutritional status assessed to screen for malnutrition. Weight-for-height indices are the most accurate tool for this assessment but are generally hard to apply and therefore not used extensively. A weight for height of less than 70% (less than 3 z scores) of the median WHO reference value, severe visible wasting, or edema of both feet is a sign of severe malnutrition. Mid-upper-arm circumference (MUAC) provides a useful alternative for initial screening of nutritional status, as it is simple, requires less equipment, and is a good indicator of lean body mass. MUAC cutoffs for severe malnutrition are as follows: less than 110 mm for infants and children under 5 years, less than 135 mm for children 6-9 years, and less than 160 mm for children 10-14 years of age (De Baets *et al.*, 2007). MUAC is useful for screening and identifying moderate or severe malnutrition but is not very good for monitoring recovery,

as the body tends to reestablish truncal tissue first and only then peripheral or limb tissue, such as upper arm tissue.

2.8.4 Nutritional supplement (to enhance energy density or increase caloric intake)

Good nutrition means getting enough macronutrients and micronutrients. Macronutrients contain calories (energy): proteins, carbohydrates and fats. They help maintain body weight. HIV-positive infants and children have increased nutritional requirements compared to HIV-negative children of the same age. Requirements will vary according to nutritional status, age, HIV-related symptoms, and comorbidities. Additional energy requirements for HIV-positive children can range from a 10% increase per day for asymptomatic children who are well nourished, to a 20%-30% increase for HIV-positive children with poor weight gain (Katherine et al., 2004).

2.8.4.1 Types of rations

- Take-home rations: Food is provided to the household to take home for storage, preparation, and consumption. A drawback is the risk that the food does not reach the targeted beneficiary as it may be sold, shared with other households, or spoiled.
- On-site feeding: Food is prepared in a central place and the beneficiaries consume the meal or snack at the site. The food will reach the targeted beneficiary, but logistics may be expensive.
- Food-by-prescription: Food is provided depending on individual assessment. It is packaged in small quantities (as a medicine) to take home and consume as prescribed.

2.8.5 Micronutrient supplement (to ensure micronutrient intake)

Micronutrients include vitamins and minerals. They help keep cells working properly, but will not prevent weight loss. The role of micronutrients in immune function and infectious disease is well established. Observational studies indicate that low blood levels and decreased dietary intakes of some micronutrients are associated with faster HIV disease progression and mortality, and increased risk of HIV transmission. Periodic vitamin A supplementation has been shown to reduce all-cause mortality and diarrhoea morbidity in vitamin A-deficient children, including HIV-infected children. In keeping with WHO recommendations, 6 to 59-month-old children born to HIV-infected mothers living in resource-limited settings should receive periodic (every 4–6 months) vitamin A supplements (Katherine *et al.*, 2004).

Table 2.2: showing a Summary of Nutrition Interventions according to HIV Disease Progression.

INTERVENTION	HIV+ Asymptomatic	HIV+ Symptomatic	AIDS	Families affected by an HIV-related Death
Counselling/care	Nutrition education and counselling for positive living	Nutrition management of HIV-related opportunistic infections (OI), symptoms, and medications	Nutrition management of ARV therapy (where available) Nutrition management in home-, clinic- and community-based, palliative care	Counselling on special food and nutritional needs of orphans, vulnerable infants, and young children
Prescribed/targeted nutrition supplementation	For high-risk groups only (e.g., pregnant and lactating HIV+ women, HIV exposed non breastfed children)	For high-risk groups For persons who are losing weight or do not respond to medications Therapeutic feeding for moderately and severely malnourished HIV+ adults and children	Therapeutic feeding for moderately and severely malnourished HIV+ adults and children	For high-risk groups (e.g., HIV-exposed non-breastfed children < 2 years or HIV-exposed children with growth faltering)
Other food interventions	To prevent nutritional deterioration for HIV-affected families living in highly food insecure communities	To improve adherence/ participation in OI treatment programs	To improve adherence/ participation in ARV and OI treatment programs To use in home-, clinic-, and community-based care programs	To protect the health of orphans and vulnerable children and for surviving family members when livelihoods are compromised because of HIV related sickness or death

Source: Piwoz *et al.*, 2004

2.9 Determinants of service provision

2.9.1 Staff

The Ministry of Health through National AIDS and STI Control Programme is committed to providing quality, affordable care to people infected with HIV, or suffering from AIDS related illnesses. NASCOP is the technical arm of the government charged with policy development and implementation of HIV/AIDS activity. It is involved in promoting VCT, comprehensive care and treatment of HIV/AIDS including nutrition support and access to essential drugs, promotion of prevention through BCC and PMTCT and the HBC programme. Currently, nutritionists/dietitians are posted to comprehensive care clinics (CCCs) in provincial and district hospitals, where HIV/AIDS treatment and care is provided. Health officials have established systems whereby ART patients and other PLWHA receiving services meet with nutritionists for nutritional assessment and counselling. Patient weight records are maintained and used to support counseling (Piwoz *et al.*, 2004).

2.9.2 Training

National AIDS and STI Control Programme promote the use of a harmonised curriculum for training HBC providers. It provides general guidelines but without any timeframe. Although the curriculum has been standardized, it is not used nationally because of the failure of the government to enforce its use. Other than NASCOP, training is provided by FBOs, NGOs, and CBOs.

National AIDS and STI Control Programme's HBC programme aims to ease the burden on the health care system and promote wider access to care services for those living in

resource-constrained settings. The need for home and community care for PLWHA has become critical. Studies show that the quality of life for PLWHA is largely determined by their access to the care and support they receive. For many of them hospital care is neither necessary nor affordable. National AIDS and STI Control Programme extends the continuum of care given from the hospital or health facility into the home of the patient. It benefits the HIV infected patient, the family, the community and the health care system.

Home-Based Care operates in the community and in the homes of PLWHA and is implemented through CHWs who are trained to provide effective home nursing care for people living with HIV/AIDS (PLWHA). They assist with a range of HBC services for example referrals, counselling and ensuring compliance with ARV therapy. CHWs promote prevention for those who take care of the infected at home and educate the caregivers on personal protection and universal precautions.

Follow-up support after training is necessary as it reminds and assures the CBW that they are not alone in the work. It is also an excellent opportunity for trainers to determine gaps in the training of the community workers. CBWs are trained on technical issues depending on the sector (Patric, 2004).

2.9.3 Access to diagnosis and treatment of HIV

It is essential to institute systems which ensure that infants known to be HIV exposed are followed regularly and tested using an HIV viral test at four to six weeks after birth to identify HIV infection before it becomes symptomatic. This would enable early initiation of ART for HIV-infected infants. Exposed infants also need to have adequate infant-

feeding support and counselling, as well as other important HIV care and treatment interventions. Access to HIV viral tests (which are recommended for the diagnosis of HIV in infants) has increased in recent years, largely as a result of the introduction of dried blood spot (DBS) specimen collection on filter paper. When test results are promptly provided and acted upon, and treatment is initiated early in infancy, HIV-infected infants experience significantly reduced morbidity and mortality (Children with HIV Early Antiretroviral Therapy [CHER] study) (Violari, 2008). In most settings, however, health workers continue to wait and test only at 18 months with HIV antibody tests. Initiation of co-trimoxazole prophylaxis is particularly important in these settings as it affords the possibility of delaying the onset of OIs in HIV infected infants prior to confirmatory diagnosis and subsequent initiation of ART.

HIV antibody testing conducted early in life can confirm HIV exposure as it detects persisting maternal HIV antibody in the infant. Antibody testing is therefore useful in identifying infants not previously known to be HIV exposed so that they too may benefit from the protection from OIs afforded by co-trimoxazole prophylaxis. It is also useful in identifying HIV-uninfected and -unexposed infants (WHO, 2007). HIV antibody testing is therefore an important intervention to screen infants and young children for HIV. Other constraints that limit health workers' ability to implement co-trimoxazole prophylaxis include limited policy support for lower-level workers to dispense co-trimoxazole prophylaxis, insufficient training on the importance of co-trimoxazole prophylaxis of those allowed to prescribe and dispense it, and failure to include co-trimoxazole prophylaxis in training materials for HIV care and treatment (WHO and UNICEF, 2009).

2.9.4 Nutritional Monitoring

Routine monitoring of the growth of pediatric patients is recommended so as to detect any growth faltering and begin supportive action before a child becomes malnourished. Any child who has experienced poor growth (compared to standard reference curves), is having trouble eating, or has lost weight since a previous clinic or home visit is in need of additional care. Since weight and growth both accurately reflect disease progression, monitoring weight and growth is an inexpensive and valuable tool for determining nutritional status that can be used in virtually any setting (Katherine 2004). Ideally, every PLHIV should receive individualized nutrition assessment and counseling. However, it is not always possible for facilities to provide nutrition assessment and counseling for all clients because of limited staffing.

Anthropometric indicators that are used to screen PLHIV for malnutrition and the need for specialized food products include BMI, mid-upper arm circumference (MUAC), weight gain and unintentional weight loss (Cogill, 2003). These indicators, are often used without further assessment to determine eligibility for the provision of specialized food products. However, specialized food products should not be given in isolation, and medical examination and care, as well as nutrition assessment and counseling, are recommended for PLHIV with malnutrition. Furthermore, other clinical indicators of malnutrition, such as bilateral pitting edema, should also be considered when determining the need for treatment of malnutrition (Tumilowicz, 2010).

Micronutrient supplements may be necessary to help PLHIV meet the RDA. If micronutrient deficiencies are suspected, trained staff or nutritionists should complete individualized dietary assessments before prescribing supplements. Because of the risk of adverse effects from some micronutrients in large doses, clients should consult the service provider before consuming specialized food products or taking micronutrient supplements in addition to those prescribed. If clients are already consuming specialized food products or micronutrient supplements, service providers should first complete individualized nutrition assessments to determine the adequacy and safety of the micronutrient levels before prescribing any additional supplementation (Tumilowicz, 2010).

CHAPTER THREE: METHODOLOGY

3.1 Study design

A descriptive study design was undertaken between the month of July and August 2008 to establish the effect of nutritional and health intervention on the status of HIV infected children under five and quantitative data was collected. This design was justifiable as it describes the current status of the under five as influenced by health and nutritional interventions.

3.2 Study site

The study was carried out in Mathare health centre one of the slums in Nairobi located within Kasarani division. The slum has a population of about 500,000 people, 95% of whom live on less than \$1 a day per family. Eighty percent of these household are headed by women. It neighbours other zones namely Huruma, Baba Dogo, Korogocho, Kariobangi and Eastleigh. There is little access to water; drainage and sewerage are virtually non-existent and there is one toilet for at least every 400 people (Warah, 2004).

The majority of residents in this area spend more than half of their income in feeding the families, which often include HIV infected relatives. This leaves a small portion to be shared among commitments such as rent and household utilities. Due to high levels of poverty compounded by HIV- related health complications, most residents including children are malnourished.

Mathare North health centre was purposively sampled among ten facilities in Kasarani division where six of them are run by the Nairobi City Council while four are run by the government. The health centre provides comprehensive care for HIV infected patients, both adults and children as it has trained clinical officers who are running the clinic. The health centre has proved its capacity not to run out of stock of drugs treating the patients. In addition, there are machines that facilitate in the treatment of the patients that is; they are used to store blood samples before they are taken to the laboratory for test. Therefore, it has been classified as a referral health centre for other clinics.

3.3 Study population

The study population was spread within Kasarani division and consisted of children under the age of 5 years old who were HIV infected and sought comprehensive care from Mathare North Health Centre. This is the only health facility offering comprehensive care for pediatrics in the division. Also in the study population were staff who offered services to mothers of the children.

3.4 Sample size determination

Sample size was determined using the formula as used by Fisher *et al.* (1998) formula recommended by Mugenda and Mugenda (1998) as effective for social sciences. Where the desired sample size for target population is over 10,000 as below

$$N = \frac{Z^2 PQD}{d^2}$$

Where N= the desired sample size if the target is more than 10,000

Z = is the value of corresponding the desired confidence level obtained from a normal distribution table (usually 95%)

P= The proportion in the target population estimated to have a characteristic being measured (7%)

Q=1- P

d = is the desired precision/margin of error (set at 0.05)

D= the desired effect which is 1.

$$N = \frac{1.96^2 \times 0.007 \times 0.993}{0.05^2} = 107$$

Thus the calculated sample was 107. This was increased to 120 to cater for any attrition.

3.4.1 Systematic sampling

This was used to select mothers or care-giver of the under five children who were the respondent into the study, that is, for every mother falling in an even position from an existing list of patients that is (2nd, 4th ...) was included into the sample to ensure that the data was well randomized to minimize bias until the desired number was secured.

3.4.2 Data collection instruments

Data for the study was collected using questionnaires (Appendix 5.0 and 5.1), which were self administered. One was addressed to mothers or care givers, while the other was administered on health workers to assess the kind of interventions that are in place for the children. Questions were asked in the order in which they are presented in the

questionnaire. During the interview, the questions were translated into Kiswahili by one of the research assistants.

3.4.3 Data collection procedure

Permission to carry out the research was sought from the relevant ministry and school at Kenyatta University. Permission was sought from the respondents and only those who consented were interviewed. Questionnaires were administered to care givers/ mothers of children under five and service providers.

Anthropometric data was collected. The equipments for taking weight and height were borrowed from the health centre. Children younger than 24 months were measured lying down (recumbent length) on the board, while standing height was measured for older children. For measurement of height, the child stood erect, without shoes with weight equally distributed on both feet and heels together and touching the vertical board and looking straight ahead. Height was recorded to the nearest 0.1 cm. Body weight was measured using hanging spring scales measuring in 100g graduations as recommended for weighing infants from birth (WHO, 2002). The child, in minimum clothing and without shoes was weighed.

3.5 Data Analyses

After completion of data collection, the questionnaire was scored. Data was edited, coded and entered into the computer for analysis. The Statistical Package for Social Sciences (SPSS 12.0) was used in the analysis. Descriptive statistics used to summarize the sample population included percentages, frequency distributions and charts. Chi-square was used to determine the relationship between categorical variables namely up-take of health and

nutrition interventions versus nutrition status and presence of illnesses. Data was measured at 95% confidence level ($p < 0.05$).

3.6 Ethical Considerations

Confidentiality was maintained by explaining the purpose of the study and seeking consent from the respondents. No information received from the study was given or disclosed to unauthorized persons, only required data was collected and used for the purpose of study.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Socio- demographic and socio-economic status among care-givers of HIV infected children.

The socio-demographic and socio-economic characteristics of the care-givers was assessed by asking the respondents about their age, marital status, number and age of their children, occupation, educational level, and income. Age and sex are important demographic variables and are the primary basis of demographic classification.

Table 4.1: Socio economic and Socio-demographic characteristics

		N	Percent
Sex of children	Male	45	37.5
	Female	55	82.5
	Total	120	100
Age of Mother	< 18 years	12	10
	18-30 years	95	79.2
	> 30 years	13	10.8
	Total	120	100
Age of child	0-11 months	57	47.5
	12-24 months	26	21.7
	25-36 months	22	18.3
	37-60 months	15	12.5
	Total	120	100
Marital status	Married	80	66.7
	Single	28	23.3
	Widow /separated	12	10.0
	Total	120	100
No of children			
	1	22	18.3
	2	48	40
	3	41	34.2
	>4	9	7.5
	Total	120	100
Occupation	Self employed	51	42.5
	Employed	5	4.2
	Unemployed	64	53.3
	Total	120	100

Education is a key determinant of the lifestyle and status an individual enjoys in a society. Studies have consistently shown that educational attainment has a strong effect on health behaviours and attitudes (KDHS 2008). The table below summarizes the socio-demographic and socio-economic status of the respondents attending Mathare health centre.

Majority of the respondents, sixty six percent were married and were in age group 18-30 years. Age groups below 18 years and above 30 years constituted a small proportion of the respondents. It was observed that most of the respondents' children were in age group 0-11 months and only 12% were in age group 37-60 months, this finding agrees with an earlier study which concluded that data is limited for ages beyond 4 years (The European Collaborative Study, 2003).

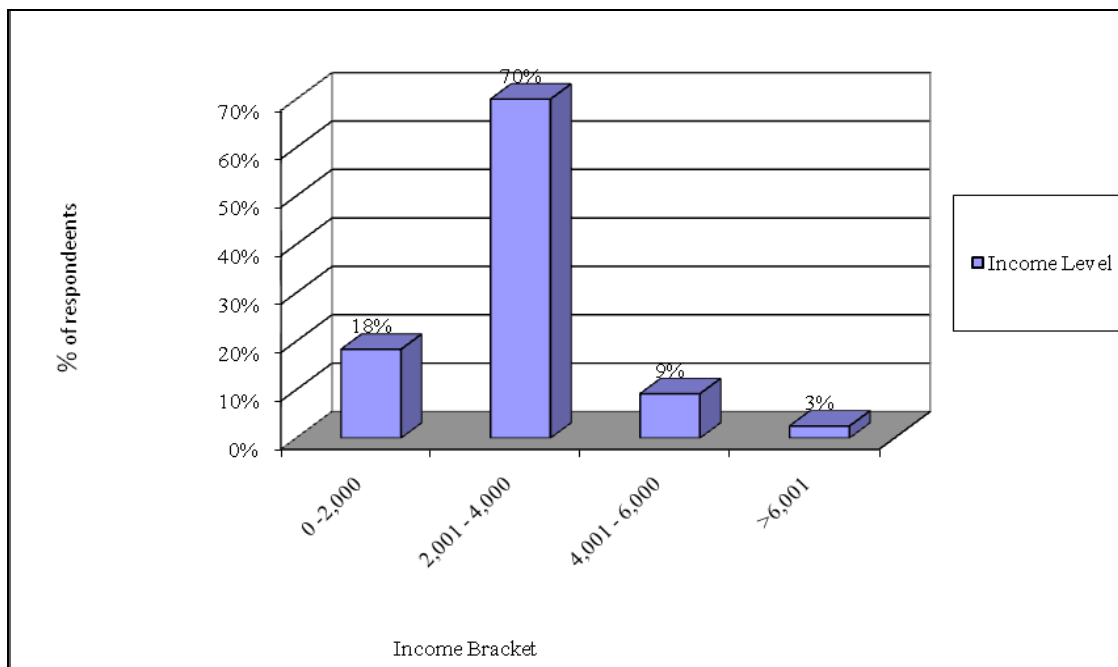


Figure 4.1 Income level of the respondents

The study found that mothers or caretakers were either engaged in micro-businesses, casual labour or were unemployed. This reflects low income among most of them with the majority (74.2%) of them earning between Ksh. 2,000 - 4,000 per month which was used to cater for all household needs as shown in figure (4.1). Most of the respondents had two children with a likelihood of having other children even though they were HIV infected, as the total fertility rate as shown by KDHS(2008) is four point seven (4.7). It was observed that, sixty five percent of the respondents had attained primary level education, and only 1% had attained tertiary education, this shows that majority of the respondents were not able to get good jobs because they lacked qualifications (figure 4.2).

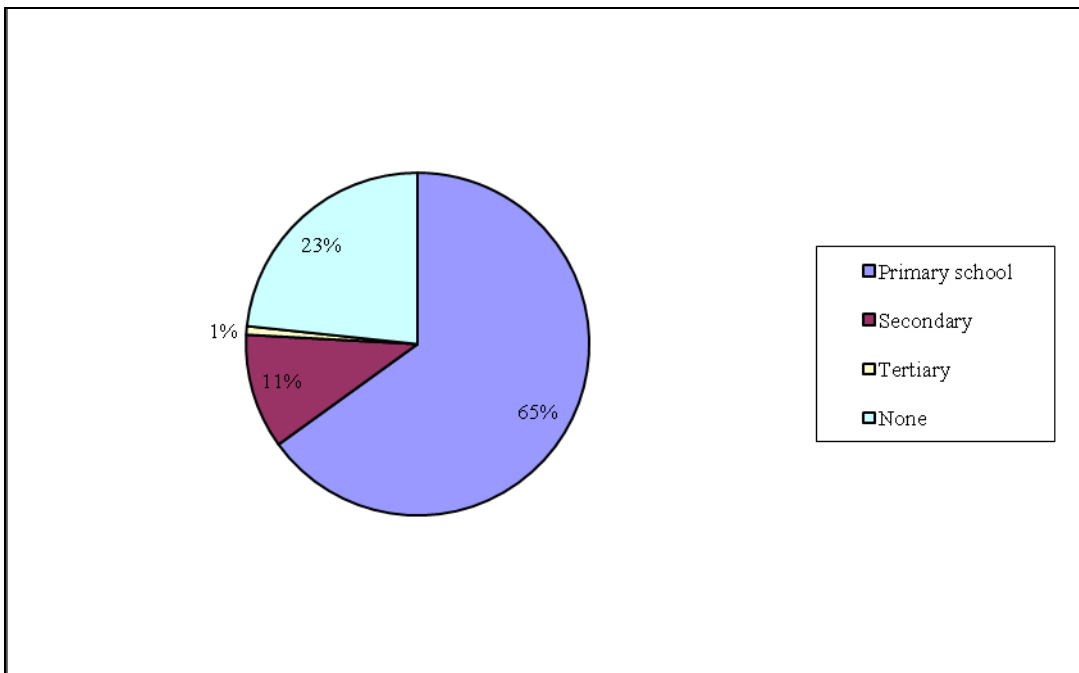


Figure 4.2 Education level of the respondents

There were no significant relationships ($p > 0.05$) between the income, marital status, education level and uptake of intervention services as shown in table 4.2, this could be attributed to the high poverty level in the area causing people not to have any choice regardless of their income, marital status and education level.

Table 4.2. Relationship between income, marital status and education level with uptake of intervention

	Provision of Intervention
Education	$X^2=13$ df=2 p=0.07
Occupation	$X^2=16$ df=3 p=0.06
Marital	$X^2=20$ df=2 p=0.08

4.2 Nutritional and health interventions in place at Mathare Health Centre and the proportion of population accessing these interventions

It has been recognized for the past decade that HIV infected children generally do not grow as well as their uninfected counter parts, but more recent evidence suggests that this is often true even in the face of adequate virologic control. Given also that growth is a predictor of survival, there has been closer scrutiny of nutritional and metabolic factors that can contribute to poor growth. (Steven and Jennifer, 2006). WHO recognizes that nutritional support is an integral part of a comprehensive response to HIV/AIDS, helping to maintain the immune system and sustain healthy levels of physical activity (WHO, 2003). According to the 2005-2010 Kenyan National HIV/AIDS strategic plan, the government identified good nutrition as a key component of the national response to the HIV/AIDS epidemic. The Ministry of Health therefore adopted the National Guidelines

for Nutrition and HIV/AIDS, deployed additional nutritionists and dietitians to CCCs to ensure sufficient human capacity to address nutritional needs (USGU, 2006).

Immunization is one of the easiest ways to prevent dangerous diseases. Immunizations can also help human immunodeficiency virus (HIV)–infected children, who are more likely to acquire preventable diseases because of a compromised immune system. The Ministry of Health recommends that everyone diagnosed with HIV take Cotrimoxazole an antibiotic that reduces the risk of early mortality by 25-46%, as well as rates of hospitalization from Malaria, Diarrhoea and Pneumonia. ART therapy in children is part of the comprehensive HIV care that prolongs survival and promotes quality of life. Children on ART therapy thrive better and are subject to fewer opportunistic infections than those who are not treated.

4.2.1 Interventions in place

The study established the following interventions being offered at the clinic: nutritional counselling, food by prescription, vitamin A supplementation, immunization, prophylaxis and antiretroviral therapy were being offered at the health centre depending on the nutritional status of the children.

4.2.1.1 Nutritional counselling

Nutritional counselling was being offered to care-giver who had children under six months. This was to enable them to maintain the feeding option they chose and effectively address any problems experienced by the child. They were given take-home

flyers to assist on day to day feeding process of the children. The other category of children receiving nutritional counselling was those who had severed recurrent illnesses because this would affect their nutrition status. The counselors had guidelines provided by the ministry of medical services which they used to illustrate to the care-giver how they would use variety of foods to improve the appetite of their children and maintain cleanliness in order to avoid recurrent infections. Counselling also targeted children who were on ART but were not thriving. This meant to empower the care-givers to help such children to improve or seek further medical attention in case of negative drug interactions. Nutritional counselling was mainly offered by the health workers and sometimes the nutritionist depending on the condition of the children, where a special diet was needed.

Table 4.3 Type of Counselling and Materials used.

Age group	Type of counselling	Materials
0-6 months	Feeding option i.e exclusive breastfeeding or replacement feeding	Flip-charts, Take-home flyers,
6-12 months	-Weaning time and foods -Continued breastfeeding for those who were being breastfed	Charts, Take-home flyers
12-59 months	-Unintentional weight loss -Initiation of ART -Consumption of specialized food products -micronutrient supplements	Nutritional guidelines, ART provision guidelines, charts

4.2.1.2 Vitamin A supplementation

Ensuring that children between six months and 59 months receive enough vitamin A may be the single most effective child survival intervention, since deficiencies in this micronutrient can cause blindness and can increase the severity of infections such as

measles and diarrhea (KDHS, 2008). Vitamin A supplementation was being administered to all children attending MCH clinic as per the government policy for all children under the age of six years. This was aimed at reducing the frequency of diarrhea and other illness. Vitamin A supplementation was being offered by the nurses at the health facility.

4.2.1.3 Food by prescription

Food by prescription was given to children who were severely underweight, stunted or wasted, it was also given to children who were on ART but did not show signs of improvement evidenced by reduction in incidences of illness. Food by prescription was only offered by the nutritionist who would assess nutritional status of the children including the MUAC and in case of oedema on the feet. Food by prescription was given to children until they recovered then it would be stopped and the children referred for nutrition counselling to maintain the good nutrition status they had achieved.

4.2.1.4 Immunization

All children in the study were being immunized as it is a requirement by the Kenya Expanded Programme of immunization. This was in line with the WHO guidelines. Children were being immunized by nurses.

4.2.1.5 Prophylaxis and ART

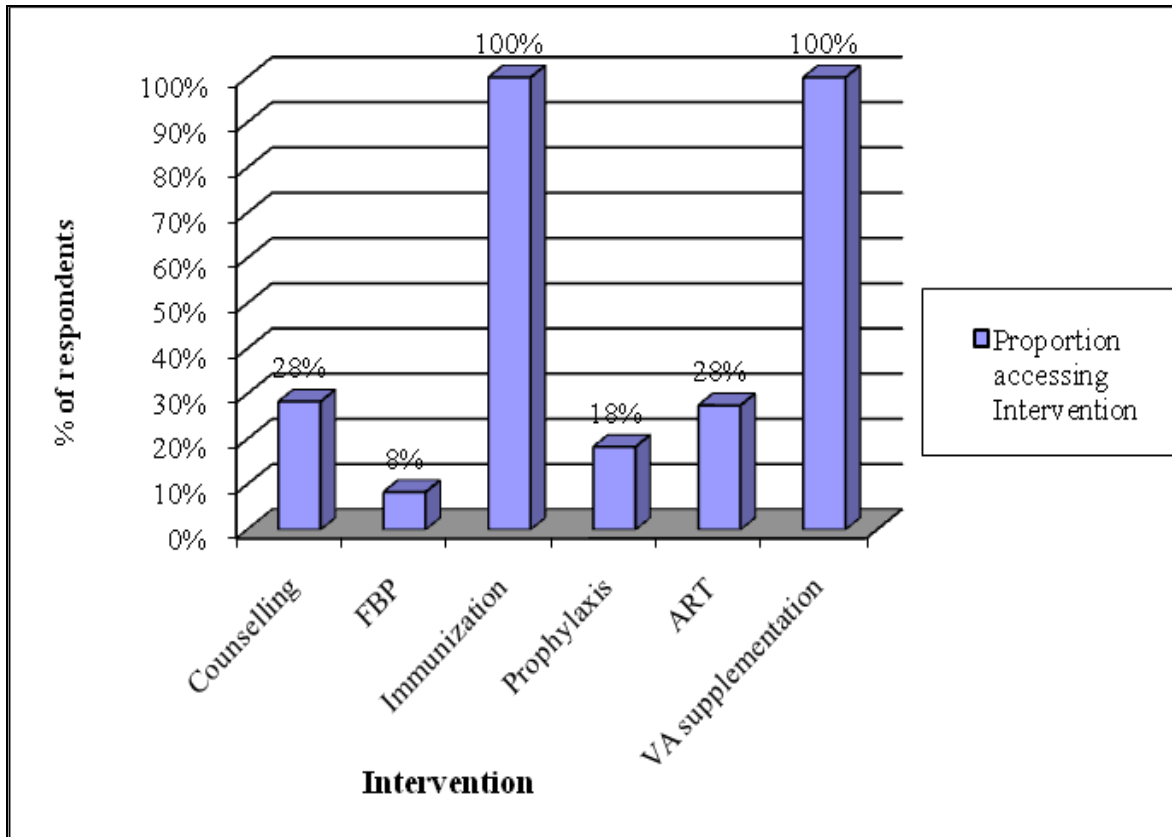
Prophylaxis and ART were being given to children who had recurrent illness and were malnourished. Prophylaxis and ART was being given by the clinical officer as it was a must that a clinical assessment is done in order for a patient to be eligible.

These findings therefore showed that Kenya has integrated nutritional interventions into the National HIV Response. According to (NASCOP 2005) the government had a major challenge in the health sector, of providing more intensive services required for HIV care and treatment throughout the country. In 2005, nutrition was recognized as an important component of comprehensive HIV care, NASCOP established a nutrition unit, led by a nutritionist that supports training and provides materials (including nutrition assessment equipment, counseling materials and job aids) on food and nutrition components of HIV treatment and care to HIV facilities throughout Kenya and Mathare North health centre is one such facilities.

4.2.2 Proportion of population using the services

4.2.2.1 Nutrition counselling

Nutrition counselling, care and support interventions for PLWHA vary according to nutritional status and the extent of disease. HIV-related infections, such as tuberculosis and diarrhoea, not only have nutritional status as a significant determinant of their incidence and severity, but they also have severe nutritional consequences that commonly precipitate appetite loss, weight loss and wasting. Prompt diagnosis and treatment of these conditions, including use of antiretroviral treatment (ART) when indicated, can contribute to improved nutrition and health (WHO, 2003).



Footnote- FBP- Food by prescription, ART- Antiretroviral Therapy, VA- Vitamin A

Figure 4.3 Proportion of children accessing intervention

The figure (4.3) shows the proportion of children attending Mathare health centre accessing different interventions. The study established that, 28% of the respondents had undergone nutritional counselling on how to improve the diet of their children, maintaining body weight, preventing food- and water-borne infections, managing dietary complications of HIV related symptoms and secondary infections, and managing side effects from ART and other medications. Nutrition counseling had a relationship with nutrition status ($p=0.043$) and no relationship with presence of illness (0.086) (Table 4.5).

4.2.2.2 Vitamin A supplementation

All the respondents reported usage of Vitamin A supplements, this was because it was the government policy that all children should be given this supplement at an interval of six months until the children attained the age of six years. Several studies in Africa have measured the impact of vitamin A supplementation on various HIV-related outcomes in children. In South-Africa, vitamin A supplementation of HIV-infected children reduced diarrhea morbidity by about fifty percent in one study (Coutsoudis *et al.*, 1995), improved immune status in another study (Hussey *et al.*, 1996) that is why it was being administered to all the children.

4.2.2.3 Food by prescription

Eight percent of the respondents reported to be using food by prescription which included plumpy' nuts and therapeutic milk. These foods were packaged in small quantities (as part of treatment therapy) to take home and consumed as prescribed. It was also established that no food rations were being offered at Mathare but children who were found to be very malnourished and needed food rations were being referred to Lea Toto' facility at Kariobangi, a nearby division. These food rations included: home rations – where food is provided to the household to take home for storage, preparation, and consumption; on-site feeding –where food is prepared in a central place and the beneficiaries consume the meal or snack at the site. Use of food by prescription had a relationship with nutrition status ($p=0.048$) and no relationship with presence of illness (0.059) (Table 4.5).

4.2.2.4 Immunization

All respondents in the study were immunized and those who had not completed the immunization programme expressed willingness to being fully immunized as required by the Kenya Expanded Programme of immunization. This information was collected from vaccination cards which were routinely provided by health facilities and clinics in Kenya on which vaccinations and other important health indicators are recorded. The high level of immunization was due to the hospital's requirement that all children must have been immunized prior to being attended to.

4.2.2.5 Prophylaxis and ART

Eighteen percent of respondents were on prophylaxis especially septrin. This was to protect the children from opportunistic infections, this number is small as the Ministry of health recommends that all infants who are HIV-infected or born to HIV-infected women should receive prophylaxis with cotrimoxazole from 6 weeks to 1 year of age or until it is established that the child is not HIV infected (NASCOP, 2005). Nineteen percent of respondents were on 1st line or 2nd line medications of ARVs. The proportion of respondents on 2nd line medication represented those whom the regimen had failed to adequately control the infection and therefore the person experienced an HIV-related infection or a decline in physical health despite at least three months of anti-HIV treatment. Use of prophylaxis had a relationship with presence of illness ($p=0.032$) and no relationship with nutrition status (0.065) (Table 4.5). Use of ART had a relationship with presence of illness ($p=0.039$) and no relationship with nutrition status (0.064) (Table 4.5).

4.2.3 Trends in provision of interventions

The hospital records indicated that on average, in the year 2005; 60 children were attended to in the Mathare hospital on a monthly basis. However, since 2006, the number increased to 82 children on average, and has been growing since. In 2007, the average number reached 105. This can be attributed to the provision of food rations to patients referred by the health centre to Lea Toto facility. This was an indicator that the proportion of children receiving nutrition care indeed increased after the introduction of interventions. It may also be a pointer to the fact that the community has knowledge on the kind of interventions being offered at the health centre. Therefore, the awareness programme undertaken by community health workers on the importance of taking the children for check up and follow-up services was yielding the desired results. In addition, the effectiveness of interventions was being felt by the community.

4.3 The nutrition and health status of the HIV infected children attending clinic at Mathare health centre.

4.3.1 Nutrition status

The links between HIV and nutritional status run both ways. It has long been known that weight loss strongly predicts illness or death among people with HIV. More recently it has been found that this applies even to people taking antiretroviral treatment. Losing as little as 3-5% of body weight significantly increases the risk of death; losing more than 10% is associated with a four- to six-fold greater risk. A Zambian study involving nearly 30,000 patients has shown that failure to gain weight six months after the start of

antiretroviral treatment increases the chance of death ten fold when compared with those who gain over 10 kilograms (Walker et al., 2007).

The forms of nutrition status referred to in this study are presented in (figure 4.4) these include stunting, underweight and wasting. Anthropometric measurements (age, height and weight) were compared to international (global) reference values for a healthy population as recommended by National Center for Health Statistics (NCHS). Data for the nutritional status of children was collected by measuring the height and weight of all the HIV infected children in the study. Data were collected with the aim of calculating three indices—namely, weight-for-age, height-for-age, and weight-for-height—all of which take age and sex into consideration.

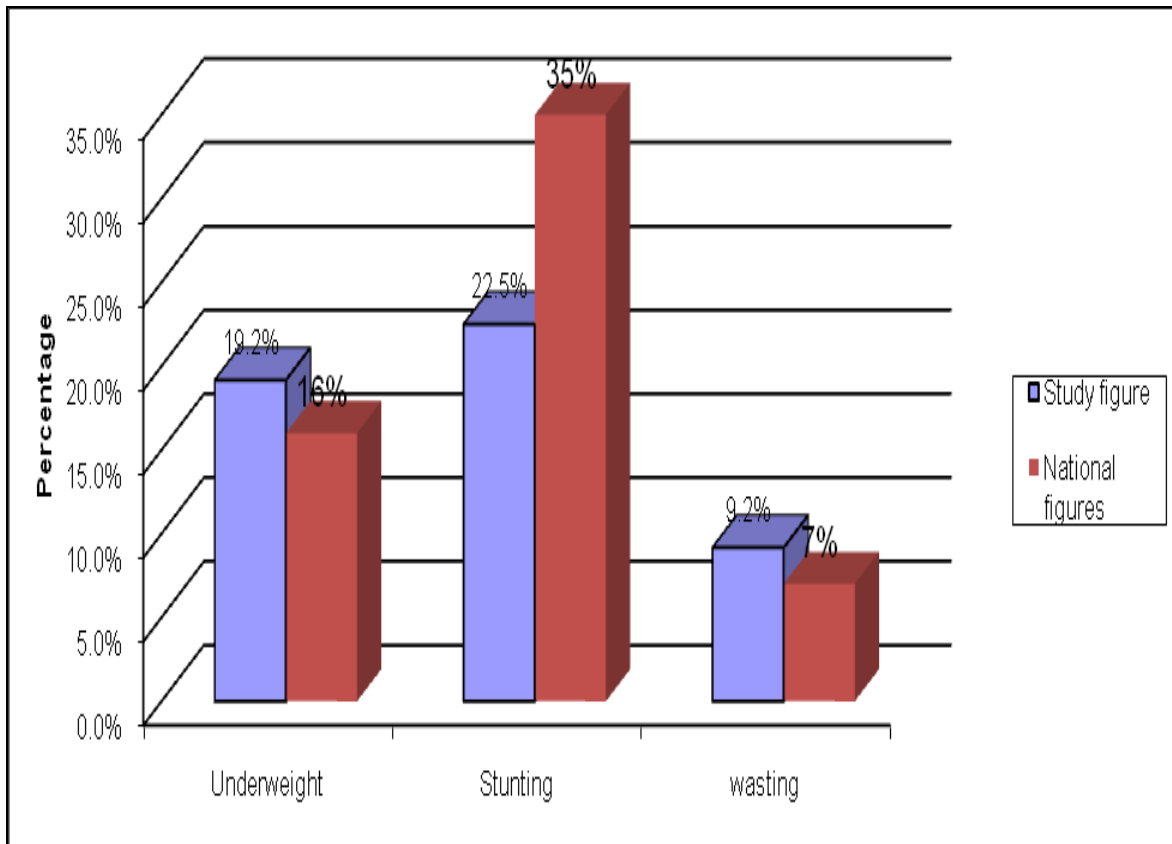


Figure 4.4 Study malnutrition figure compared to national figure

The proportion of underweight children is negatively correlated with the level of education of the mother. The study findings show that nineteen percent of the children were underweight, this figure is high compared to the national figure of sixteen percent. Most of the mothers or care-givers in the study had only attained the primary level education, this finding agrees with that of KDHS that children whose mothers have no education have the highest levels of underweight (KDHS, 2008). Underweight is a common nutritional problem for HIV-positive children which includes poor growth compared to peers and a higher risk of becoming malnourished.

Twenty-two percent of children were stunted, this level is low compared to the national figure of thirty-five percent. This is because the study concentrated mostly on the children who were severely stunted. The study also established that eleven percent of the children were wasted, this figure is high compared to the national figure of seven percent, (KDHS, 2008). Reductions in length or height of HIV-positive children are common, and poor growth (slow weight gain or decreasing weight) is often apparent even before opportunistic infections or other AIDS symptoms appear.

4.3.2 Health status

4.3.2.1 Morbidity patterns

Children who are HIV infected surviving the first year of life are more likely to die from common childhood illnesses, these include: respiratory infections, diarrhoea and tuberculosis (Taha *et al.*, 1999). Figure (4.4) shows the percentage of children who fell sick two weeks prior to the study.

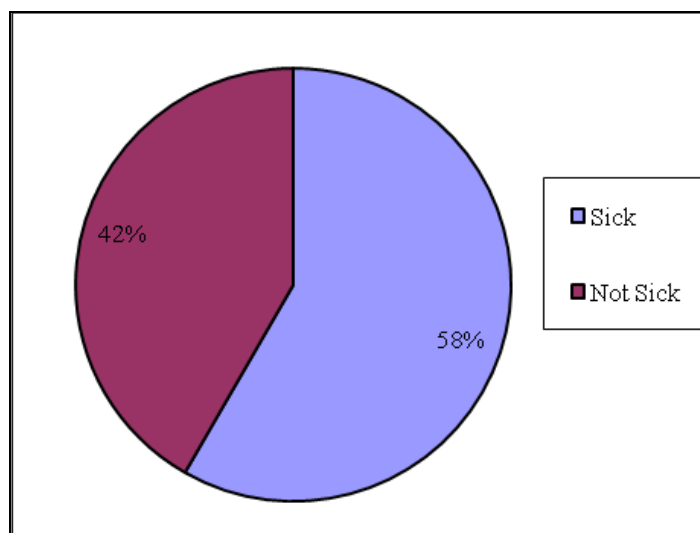


Figure 4.4 morbidity pattern

Table 4.4 Illness and symptoms with nutrition implication

Health condition		N	%
Illness	Malaria	15	12.5
	Cold	34	28.3
	Pneumonia	16	13.3
	Cough	21	17.5
	Tb	2	1.7
Symptoms	Diarrhoea	46	38.3
	Fever	20	16.7
	Loss of appetite	35	29.2
	Sore mouth	17	14.2

The most frequent illnesses and symptom reported at the health centre were diarrhoea (38%), loss of appetite (29%), cold (28%) followed by cough and fever respectively (table 4.4). The high level of diarrhoea and loss of appetite can be associated with the low level of hygiene due to little access to water, crowding and poor housing standard in the slum. Findings also indicate that majority of the children suffered from diarrhoea and loss

of appetite two weeks prior to the study, this agrees with other studies that, common problems in HIV-positive children that can complicate pediatric nutrition and health care include diarrhea; nausea; vomiting; poor appetite (anorexia); difficulty eating during or after an illness; a sore mouth or throat caused by thrush, herpes, infections, or other conditions; and changes in the taste or texture of foods or food cravings due to illness or side effects of medications.

Colds and coughs can be transmitted from one person to another through air. The slums are overcrowded explaining why there is high occurrence of this illness. The commonest causes of death in the HIV infected infants and children are respiratory infections, diarrhoea and tuberculosis, which commonly result from several risk factors, including opportunistic infections and under-nutrition (Taha *et al.*, 1999), with all-cause mortality being greatest among those with low weight (Newell *et al.*, 2004). Most of the respondents when they were asked when their children fell sick if they sought medical attention from the doctors or qualified people, they said that some of the illness were not serious thus they would buy medicine from the chemist without prescription.

4.4 The relationship between health and nutrition interventions, health status and nutrition status.

Table 4.5 shows the relationship between up-take of services, nutrition status and presence of illness

Variable	Nutrition status	Presence of illness
Up-take of services		
Nutrition counselling	$X^2=12;df=4;p=0.043^*$	$X^2=16;DF=9;P=0.086$
FBP	$X^2=8;df=3;p=0.048^*$	$X^2=20;df=6;p=0.059$
Prophylaxis	$X^2=14;df=3;p=0.065$	$X^2=21;df=5;p=0.032^*$
ART	$X^2=18;df=3;p=0.064$	$X^2=20;df=6;p=0.039^*$

Footnote- FBP- Food by prescription, ART- Antiretroviral Therapy, *- significant relationship at $p = 0.05$.

Nutritional counseling has been shown to be effective and it has also been shown to influence health outcomes. There was a significant relationship between Nutritional counselling and nutrition status of children this may be because it facilitates access to dietary intake in the sense that people are made aware of nutritious foods which are cheap and easily available. This finding agree with other studies done by Rabeneck and Mckinley that nutritional counseling is effective and also has influence on nutrition and health outcomes. Another community-based study in Delhi including a nutrition education of four months where mothers showed significantly higher nutrition knowledge and the dietary iron intake of children was significantly higher than their control group counterparts thus illustrating the importance of nutrition counselling [Kapur, 2003].

There was also a relationship between food by prescription and nutrition status. Up-take of Prophylaxis and ART showed a significant relationship with presence of illness but not

with nutrition status. In Zambia, antiretroviral therapy and once-daily co-trimoxazole prophylaxis reduced mortality among HIV-infected children by six fold, yielding results comparable with those recorded in high-income settings (Walker *et al.*, 2007).

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Socio-demographic and socio- economic status of care-givers that influence access to interventions.

Study findings indicate that marital status, mother's education and income level were significant factors that influenced access to interventions. In most cases, children who were being attended to at the centre, had both parents alive and present in the family unit. Such children were consistently taken for check - ups and it was evident they were responding well to the interventions. The majority of care givers having attained some level of formal education appreciated the importance of taking their children for clinic and follow-up services. They were also consistent in doing this, hence the positive results. The low levels of household incomes motivated care givers to take their children to the health centre, since it offered free or subsidized services. This finding rejects the null hypothesis that "The socio- demographic and socio-economic status among care-givers does not affect the provision of health and nutrition interventions among HIV infected children.

5.2 Nutritional and health interventions in place at Mathare Health Centre and the proportion of population accessing these interventions

The findings show that the interventions at Mathare health centre included: nutritional counselling, micro-nutrient supplementation, food by prescription, immunization, ART and provision of prophylaxis. According to (NAS COP 2005) the government had a major challenge in the health sector, of providing more intensive services required for HIV care

and treatment throughout the country. In 2005, nutrition was recognized as an important component of comprehensive HIV care, NASCOP established a nutrition unit, led by a nutritionist that supports training and provides materials (including nutrition assessment equipment, counseling materials, job aids) on food and nutrition components of HIV treatment and care to HIV facilities throughout Kenya and Mathare North health centre is one of the facilities.

The study established that, twenty eight percent of the respondents had undergone nutritional counselling, eight percent of the respondents reported to be using food by prescription while all the respondents were receiving Vitamin A supplement. The study also established that, eighteen percent of respondents were on prophylaxis especially septrin, nineteen percent of respondent's children were on 1st line or 2nd line doses of ARVs while all respondents in the study were immunized and those who had not completed the immunization programme expressed willingness to being fully immunized. This finding partially agrees with the null hypothesis that “The nutrition and health interventions in place at Mathare health centre are not adequate for HIV infected children” whereas immunization and Vitamin A supplementation were being given to all the children, prophylaxis was being given to a small proportion, yet the government had recommended that all who are HIV infected or exposed should be given this intervention.

5.3 Determine the nutrition and health status of the HIV infected children attending clinic at Mathare health centre.

Twenty two percent of children in the study were stunted, eleven percent wasted while nineteen percent of the children were underweight. The most frequent illnesses and

symptoms in the area were diarrhoea (38%), loss of appetite (29%), cold (28%) followed by cough and fever respectively. The malnutrition figures are almost close to those of the national figure thus accepting the null hypothesis that “the nutrition and health status of the HIV infected children attending clinic at Mathare health centre is poor”.

5.4 Relationship between health and nutrition interventions, health status and nutrition status.

There was a significant relationship between nutritional counselling and nutrition status of children. There was also a relationship between food by prescription and nutrition status. Up-take of Prophylaxis and ART showed a significant relationship with presence of illness but not with nutrition status. This agreed with a study done in Zambia, where antiretroviral therapy and once-daily co-trimoxazole prophylaxis reduced mortality among HIV-infected children by six fold, yielding results comparable with those recorded in high-income settings (Walker *et al.*, 2007). This finding therefore rejected the null hypothesis that there was no significant relationship between health and nutrition interventions, health and nutrition status among HIV infected children attending Mathare health centre.

5.5 Conclusion

The study therefore concludes that:

- The nutritional intervention in place at Mathare North health centre were; nutrition counselling, food by prescription which included plumpy’ nuts and

therapeutic milk and vitamin A supplements. The respondents who had very malnourished children had to obtain referrals to a nearby division for food rations and therapeutic feeding.

- The Health intervention in Mathare North health centre included: Immunization which was being recorded on vaccination cards, provision of prophylaxis to all the children who showed symptoms of opportunistic infections and Antiretroviral Therapy.
- The nutrition and health status of the HIV infected children attending clinic at Mathare health centre was poor since the malnutrition figures were almost close to those of the national figure.
- There was a significant relationship between nutritional counselling and nutrition status of children. There was also a relationship between food by prescription and nutrition status. Up-take of Prophylaxis and ART showed a significant relationship with presence of illness but not with nutrition status.

5.6 Recommendation

- Nutrition and Health interventions adopted by the government have been implemented in the health facilities as established by the study. However, there is need for the government to ensure accessibility to these interventions so that its recommendations can be adhered to. There also need to assess the success of the interventions by identifying relevant indicators which can be used to monitor the effects of the interventions on the health and nutritional status of the respondents.

- There was significant relationship between nutritional counselling and nutrition status. Due to its affordability, the coverage of this intervention should be extended to enable easier access to all HIV infected children.

5.7 Suggestion for further studies

- Evaluation of the impact of specific health and nutritional interventions for management of HIV-infected patients experiencing severe infectious complications by including assessments of dietary intake, anthropometry and biochemical.

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APPENDICES

5.1: Mothers' Questionnaire

I am Crippina Lubeka, a postgraduate student at Kenyatta University undertaking a research as part of the requirement of the degree of Master of Public Health. This is aimed at assessing the impact of nutritional interventions on the health and the nutritional status of the HIV infected children. Kindly complete this questionnaire as openly as possible; any information provided will be treated as confidential and used for academic purposes only. Your corporation will be greatly appreciated.

Questionnaire no. Date of Interview

A. Demographic Data and Socio-Economical Information

1. What is your marital status?

- a) Single b) Married c.)Divorced d) Widowed

2. What is the age of the mother?

- a) Below 18 years b) 18 - 30years c) Above 30 years

3. What's the mother's occupation?

- a.) Employed b.)Self employed c.) Business lady d) unemployed

4. How many children are in the family?

- a) 1 b) 2 c) 3 d) 4 and above

5. What is your highest level of education?

- a.)No education b.)Primary c.)Secondary d.)Tertiary

e.)Other (specify)

6. What's your main source of cooking fuel?

- a) Charcoal b.)Kerosene c.) Gas d.) Electricity e.) Other (specify)

7. What is your monthly income?

- a.) 1,000 – 2,000 kshs b.) 2,000 – 4,000 kshs c.) 5,000 – 7,000 kshs
d) Others specify.....

8. How much do you spend on food per month?

- a) 1,000 – 2,000 kshs b) 2,000 – 3,000 kshs c) 3,000 kshs and above

9. What type of house do you live in?

- a) Mud walled structure b) Card structure c) Iron sheet structure
d) Stone structure

B. CHILD CHARACTERISTIC AND HEALTH INFORMATION

10. What is the age of the child?

- a) 0 – 11 months b) 12 – 24 months c) 25 – 36 months d) 37–60 months

11. What is the sex of the child?

- a.) Male b.) Female

12. Nutritional status

- a) Normal weight b) Wasted c) Underweight

13 Current Weight.....current height.....

14. Is the child immunized? If yes state the immunization.....

C. FEEDING PRACTICE

14. Which feeding option are you using?

- a) Commercial infant formula b) Home-modified animal milk c) Exclusive
breastfeeding d) Wet- nursing e) Expressing and Heat-treating breast milk
f) Breast-milk banks

15. Why did you choose it?

16. In your chosen feeding option what are some of the challenges you encounter.....
.....
.....

17 . Have the counsellor monitored the progress for your chosen feeding option? Y/N

18. If yes to question 17 above, how many times has the follow up been done for the last three months?

19 Morbidity pattern in the last two weeks before research and the kind of medical intervention sought.

ILLNESS/symptoms	Last two weeks	Duration	Medical attention
diarhoea			
Cold			
Cough			
malaria			
pneumonia			
Tb			
Fever			
Loss of appetite			
Sore mouth			

5.2: Service providers' questionnaire

1. Please circle the option that best describes your position

Issue	Parameters		
Training undergone	Breastfeeding counselling	HIV and infant feeding	Other (specify)
Duration of above training	0-3months	3-6 months	6-12 months
Patients (no. of children handled before intervention)	1-10	10-20	Over 20
Patients (no. of children handled after intervention)	1-10	10-20	Over 20
Reported dietary modification (after intervention)	1-10	10-20	Over 20
Weight improvement noticed on children after intervention	1-10	10-20	Over 20
Frequency of opportunistic infections	Increased	No change	reduced

2. Are community health workers allowed to

(a) Initiate co-trimoxazole prophylaxis?

(b) Resupply co-trimoxazole prophylaxis after it has been initiated?

3. Are prescriptions required?

4. Is content on co-trimoxazole prophylaxis for infants and children included in the pre-service nursing, medical and pharmacy school curricula?

a. _____

b. _____

2. Is content on co-trimoxazole prophylaxis for infants and children included in

a) continuing education/in-service training?

b) If so, for which cadres of health workers?

5.3: MAP



5.5 RESEARCH AUTHORISATION LETTER



REPUBLIC OF KENYA

MINISTRY OF HIGHER EDUCATION SCIENCE & TECHNOLOGY

Telegrams: "SCIENCE TEC", Nairobi
Telephone: 02-318581
E-Mail: ps@scienceandtechnology.go.ke

JOGOO HOUSE "B"
HARAMBEE AVENUE,
P.O. Box 9583-00200
NAIROBI

When Replying please quote

Ref. MOHEST 13/001/ 35C 21/2

23rd June 2008

Lubeka Buyanzi Crippina
Kenyatta University
P.O. Box 43844
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on,
'Assessment of Nutritional and Health Interventions on HIV/Positive Children under Five years in Mathare North Health Centre, Nairobi,

I am pleased to inform you that you have been authorized to carry out research in Mathare North Health centre for a period ending 30th August, 2008.

You are advised to report to the Medical Superintendent, Mathara North Health Centre before embarking on your research.

On completion of your research, you are expected to submit two copies of your research report to this office.

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to:

The Medical Superintendent
Mathare North Health Centre
NAIROBI