THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH & SOCIAL WELFARE

National Training Package on Paediatric HIV and AIDS Care and Treatment

Participants Handbook

NACP

October, 2015

Foreword

In Tanzania, HIV and AIDS is one of the leading causes of morbidity and mortality with negative demographic, social, economic and population health consequences. The HIV prevalence in Tanzania mainland among people aged 15-49 years is 5.1% according to the Tanzania HIV and AIDS and Malaria Indicator Survey 2011-12 (THMIS 2013). Despite the higher prevalence among women (6.3%) than men (3.9%), the overall HIV prevalence has significantly declined from 7% in 2003/04 to 5.1% in 2011/12. The progressive decline in prevalence is due to the national strategic interventions towards HIV and AIDS prevention, care, treatment and support.

However, the HIV prevalence (1.0%) among adolescents (15-29 years) remains unchanged, and 2% of young women aged 15-24 years are HIV-positive (THMIS 2013). According to UNAIDS (2013) estimates, 250,000 children aged 0-14 years are living with HIV infection in Tanzania and AIDS accounts for 1,300,000 orphans aged 0-17 years. Over 90% of paediatric HIV infection is acquired from their mothers during pregnancy, delivery or breastfeeding. HIV has a negative impact on under-five mortality rates, with high mortality rates among untreated HIV infected infants and young children. HIV infection progresses more rapidly in children than in adults, and most children die early before the confirmation of their HIV infection status. Although available evidence shows that children on antiretroviral therapy (ART) have a remarkable reduction in morbidity and mortality, only 5.7% of children in need are actually on ART in Tanzania. The challenges that hinder increasing enrolment of children to HIV and AIDS care and treatment service include inadequate expansion of PMTCT intervention, inadequate awareness of paediatric HIV and AIDS among health care providers and the community, and inadequate training of human resource for health.

The goal of the Ministry of Health and Social Welfare (MoHSW), through the National AIDS Control Programme (NACP), is to accelerate availability and equitable access of paediatric HIV and AIDS Care and Treatment services, including early infant diagnosis of HIV, in order to identify HIV-infected children earlier during their first months of life and start them on ART and other appropriate interventions to improve their survival to adolescence and adulthood.

In view of the above, the MoHSW in collaboration with the International Training and Education Centre for Health (I-TECH) and other implementing partners, has developed the National Paediatric HIV and AIDS Care and Treatment Training Package for Health Care Providers to equip providers with the knowledge, skills and attitudes that empower them to provide effective comprehensive paediatric HIV and AIDS prevention, diagnosis care, treatment and supportive services to HIV-infected and -affected children and their families. This Training Package is in line with the National Guidelines for Management of HIV and AIDS 5th edition 2015, the National PMTCT Guidelines and the National Road Map Strategic Plan to Accelerate Reduction of Maternal, Newborn and Child Deaths.

The package is organised into eleven (11) modules. Module One covers the epidemiology of paediatric HIV infection (globally and nationally); the structure, biology and life cycle of HIV; pathophysiology and natural history of HIV in children; and principles of comprehensive care for children living with HIV. Module Two covers clinical evaluation for paediatric HIV infection (common clinical presentations) and diagnosis and staging of paediatric HIV Infection; while Module Three intends to equip health workers with knowledge and skills to provide improved diagnosis, management and prevention of HIV-

related diseases, opportunistic infections (OIs), directly responsible for the morbidity and mortality HIV-infected children. Module Four aims at imparting knowledge to health workers on antiretroviral medicines (ARVs) and ARV regimens as well as appropriately initiating and monitoring response to ARVs. Module Five imparts knowledge and skills to health workers on adherence issues for children and adolescents while Module Six empowers the health workers to provide effective integrated HIV and AIDS services for adolescents. Module Seven enables health workers to provide quality psychosocial care and support for HIV-infected and -affected children and their families, while Module Eight covers the transmission of HIV in children and the importance of PMTCT in care of HIV-exposed infants. Module Nine enables health workers to provide an integrated maternal and child care for HIV-infected mothers and their children, and management of malnutrition in HIV-infected and -affected children; while Module Ten aims at increasing enrolment of children to paediatric HIV and AIDS care, treatment and support services as well as effective referrals to other community-based services. Furthermore, Module Eleven aims at providing an opportunity for participants to practise newly learned skills under the supportive supervision of a clinical instructor(s) or experienced practitioner(s).

The package is designed as a simplified provider-centred working tool to enhance easy reading and basic referencing for paediatric HIV and AIDS services. The key areas covered in the package promote a holistic care approach in provision of paediatric HIV and AIDS Care and Treatment services so as to significantly reduce morbidity and mortality in HIV-infected children.

The MoHSW recommends this Training Package for health care providers in both public and private facilities, implementing partners and other stakeholders to ensure that the strategic accelerated approach leads to both an increased access and improved quality of paediatric HIV and AIDS prevention, care, treatment and support services; and hence an accelerated children survival in Tanzania.

Users of this package are invited to continuously provide feedback related to their experience in using this package in order to improve and update it in line with the dynamic scientific and technological advances in paediatric HIV and AIDS prevention and management. Overall, the MoHSW highly values your partnership towards achieving the UNAIDS vision of "Zero new HIV infections. Zero discrimination. Zero AIDS-related deaths."

Prof. Muhammad Bakari,
Chief Medical Officer

Acknowledgements

This document was developed by the Ministry of Health and Social Welfare (MOHSW) through National AIDS Control Programme in collaboration with University of Washington International Training and Education Centre for Health (I-TECH)

The content for this course was developed by using updates from books, HIV and AIDS care and treatment guidelines and experts who participated in the development of the material.
The development of these materials was made possible by financial support from the US Government through the Cooperative Agreement U69HA00047 from the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA). The Ministry would like to thank the US Government for this support. Furthermore the Ministry would like to thank the US Centers for Disease Control and Prevention (CDC) for their role in the development of these materials.

The Ministry would like to extend special thanks to the Technical working group experts and implementing partners for their contribution towards the development of the National training on Pediatric HIV and AIDS Care and Treatment Training materials.
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Finally, the MoHSW also extends special thanks to the National AIDS Control Programme (NACP) staff for their guidance and Technical support towards development of this training package.

Prof. Muhammad Bakari

Chief Medical Officer
Ministry of Health and Social Welfare

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Course Contents

List of Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ANECCA	The African Network for the care of Children Affected by AIDS
ANC	Antenatal Care
ART	Anti –Retroviral Therapy
ARDS	Acute Respiratory Distress Syndrome
ARV	Anti – Retrovirals
CD	Cluster of Differentiation
CTC	Care and Treatment Clinic
CTX	Contrimoxazole
CBO	Community based Organization
CME	Continuing Medical Education
DOT	Directly Observed treatment
DBS	Dry Blood Spot
DNA	Deoxyribonucleic acid
ELISA	Enzyme–Linked Immunosorbent Assay
EPI	Expanded Programme on Immunization
EIDT	Early Infant Diagnosis and Treatment
FBO	Faith Based Organization
GM	Growth Monitoring
HCP	Health Care Provider
HIV	Human Immunodeficiency Virus
HTC	HIV Testing and Counselling
HIMS	Health Management Information System
HBC	Home Based Care
IMAI	IMAI-Integrated Management of Adolescent and Adult illnesses
ITNs	Insecticide Treated Nets
IPC	Infection ,Prevention and Control
M & E	Monitoring and Evaluation
MOHSW	Ministry of Health and Social Welfare
MSD	Medical Stores Department
MTCT	Mother to Child Transmission

NGO	Non-Governmental Organization
NACP	National AIDS Control Programme
NTLP	National Tuberculosis and Leprosy Program
NNRTIS	Non Nucleoside Reverse transriptase Inhibitors
NRTIs	Nucleoside Reverse Transcriptase Inhibitors
QA	Quality Assurance
HR	Human Resources
RNA	Ribo- Nucleic Acid
ReSomal	Rehydration solution for Malnutrition
RCH	Reproductive and Child Health
PCR	Polymerase Chain Reaction
PCP	Pneumocystis carinii Pneumonia
PEP	Post Exposure Prophylaxis
PITC	Provider Initiated Testing and Counselling
PLHIV	People Living with HIV
PI	Protease Inhibitors
OIs	Opportunistic Infections
PMTCT	Prevention of Mother – to – child Transmission
STI	Sexually Transmitted Infection
SOPs	Standard Operating Procedures
UNAIDS	United Nations Joint Programme for HIV and AIDS
UNICEF	United Nations International Children's Fund
TFDA	Tanzania Food and Drug Authority
TB	Tuberculosis
CITC	Client initiated Testing and Counselling
WHO	World Health Organization

NATIONAL TRAINING ON PAEDIATRIC HIV AND AIDS CARE AND TREATMENT-SCHEDULE

Day 1: MC

Time	Session	Responsible Person
08:00 – 08:15	Registration and welcome remarks	All
08:15 – 09:15	**Session 0:** Introduction, expectation, goals, Agenda and pre-test	
09:15- 10:00	**Session 1: 1:** Principle of comprehensive care for children living with HIV	
10:00 – 10:30	**TEA BREAK**	**ALL**
10:30–11:30	**Session 1:2:** Epidemiology of Paediatric HIV Infection	
11:30 – 12:30	**Session 1:3**: The Biology of the Human Immunodeficiency Virus	
12:30 – 13:30	**LUNCH BREAK**	**ALL**
13:30 – 14:45	**Session 1:4:** Pathophysiology and Natural History of HIV infection in Children	
14:45 – 16:00	**Session2:1:** Clinical Evaluation for Paediatric HIV Infection	
16:00 – 17:30	**Session 2:2:** Diagnosis and Staging of Paediatric HIV Infection	
17:30 –18:00	**Daily Evaluation and BREAK**	**ALL**
18:00 – 18:30	Facilitators Meeting	Facilitator

Day 2: MC

Time	Session	Responsible Person
08:00 – 08:05	Review responses from Daily Evaluation	MC
08:05 – 08:35	**Session 3: 1**: Common Infections in Paediatric HIV	
08:35 – 09:35	**Session 3: 2**: Opportunistic Infections in Paediatric HIV	
09:35-10:25	**Session 3:3**: Diagnosis of TB in Children	
10:25 – 10:55	**TEA BREAK**	**ALL**
10:55–12:10	**Session 3:4:** Management of TB in Children	
12:10 – 13:10	**Session 3:5**: Pneumocystis Pneumonia (PCP)	
13:10 – 14:00	**LUNCH BREAK**	**ALL**

14:00 – 14:45	**Session 3: 6:** Other HIV-related Conditions	
14:45 – 15:00	**Session 4:1**: Introduction to Antiretroviral Therapy	
15:00-16:30	**Session 4:2:** Antiretroviral Medications	
16:30-17:15	**Session 4:3**: Initiating and Monitoring ART in Children	
17:15 –17:30	**Daily Evaluation and BREAK**	**ALL**
17:30 – 18:00	Facilitators Meeting	Facilitator

Day 3: MC

Time	**Session**	**Responsible Person**
08:00 – 08:05	Review responses from Daily Evaluation	MC
08:05-08:50	**Session4: 4:** When to Change or Stop ART	
08:50-10:20	**Session 5:1**: Adherence to Medication for Children and Adolescents	
10:20-10:50	**TEA BREAK**	**ALL**
10:50 – 11:00	**Session 6:1**: Burden of HIV Disease Among Adolescents	
11:00 – 11:30	**Session 6:2:** Stages of Adolescent Growth and Development	
11:30 – 12:15	**Session 6:3**: Sexual and Reproductive Health Services for Adolescents	
12:15-13:15	**Session 6:4:**Adolescent HIV Care and Setting up Adolescent Friendly HIV services	
13:15 – 14:00	**Lunch**	**ALL**
14:00-14:45	**Session 6: 5: Life Skills Required by Adolescents**	
14:45 – 15:30	**Session 7:1**: Psychosocial Problems in Paediatric HIV	
15:30–17:00	**Session 7:2:** Communication and Counselling in paediatric HIV	
17:00-18:30	**Session 7:3**: HIV Disclosure in Children	
18:30 – 18:45	**Daily Evaluation and BREAK**	**ALL**
18:45 – 19:00	Facilitators Meeting	Facilitator

Day 4:

Time	Session	Responsible Person
08:00 – 08:05	Review responses from Daily Evaluation	MC
08:05 – 09: 05	**Session 7:4**: Support Services for Orphans and Vulnerable Children	
09:05 – 10:25	**Session 8:1**: Mother-to-child Transmission of HIV and Its Prevention (PMTCT	
10:25 – 10:55	**Session 8:2:** Linking PMTCT and Care of the HIV Exposed Infant	
10:55 – 11:25	**TEA BREAK**	**ALL**
11:25 – 11:40	**Session 8:3**: Horizontal HIV Transmission in Children	
11:40–12:40	**Session 8:4**: Standard Precautions and Post-Exposure Prophylaxis (PEP)	
12:40 – 13:10	**Session 9:1:** Routine Childhood Services	
13:10 – 14:10	**LUNCH BREAK**	**ALL**
14:10 – 15:30	**Session 9:2:** Nutritional Management in Paediatric HIV and AIDS	
15:30 – 16:45	**Session 9: 3**: Management of severe malnutrition in HIV infected and affected children	
16:45-17:15	**Module ten:(will continue day six)** **Session 10:1**: Paediatric HIV Service Delivery Organization	
17:15–17:45	**Daily Evaluation and BREAK**	**ALL**
17:45 – 18:30	Facilitators Meeting	Facilitators

Day 5: **MC**

Time	Session	Responsible Person
08:00 – 08:05	**Review responses from Daily Evaluation**	
08:05 – 08:20	**Session11: 1**:Structured Paediatric HIV Care /ART Practicum at designated Facilities	
08:35 – 09:05	**PRACTICUM**	
09:05-09:35		
09:35-10:30		

10:30 – 11:00	**TEA BREAK**	**ALL**
11:00–11:35	**PRACTICUM**	
11:35 – 13:30		
13:30 – 14:30	**LUNCH BREAK**	**ALL**
14:30 – 15:00	Prepare report from the field	
15:00 – 16:30	Share report from the fields and discussions	
16:30 –16:45	**Daily Evaluation and BREAK**	**ALL**
16:45 – 17:30	Facilitators Meeting	Facilitators

Day 6:

Time	**Session**	**Responsible Person**
08:00 – 08:05	**Review responses from Daily Evaluation**	
08:05 – 08:35	**Session10: 2:** Referral Mechanisms for HIV exposed and infected Children	
08:35 – 09:05	**Session 10:3**: Prescription Handling	
09:05-09:35	**Session 10:4:**Overview of Health Logistics Systems	
09:35-10:30	**Session 10:5:**HIV and AIDS Commodities Logistics Management tools	
10:30 – 11:00	**TEA BREAK**	**ALL**
11:00–11:35	**Session 10:5**:HIV and AIDS Commodities Logistics Management tools	
11:35 – 13:05	**Session 10:6:**Patient Monitoring Systems	
13:05 – 14:05	**LUNCH BREAK**	**ALL**
14:05 – 15:05	**Session 10:7**: Overview of Quality Improvement in Paediatric ART Services	
15:05 – 15:35	**Post -Test**	
15:35-16:15	**Final Course Evaluation**	
16:15-!6:30	**Closing remarks**	
16:30 –16:45	**BREAK**	**ALL**
16:45 – 17:30	Facilitators Meeting	Facilitators

Please note: ***The day for practicum will depend on the availability of children at the practicum site. Trainers need to be flexible.***

Ministry of Health & Social Welfare: The United Republic of Tanzania

National Training on Paediatric HIV and AIDS Care and Treatment

Total Session Time: 1 hour

Welcome and Introductions

Introductions
This part allows you to introduce yourself and get to know more about one another by following the questions below:

- Your name (what would you like to be called during this training?)
- What are you doing?
- Where are you working?
- How many years of working experience in HIV and AIDS
- What do you hope or expect to learn in this workshop (your expectations)?

Overall Goal, Objective of the Course, Training Outline and Logistics

Objectives of this course
This course will equip you with required competences to be able to organize and plan for paediatric care and treatment services at facility level. Therefore, the overall objectives of the course include:

- To equip Health Care Providers (doctors, clinical officers, nurses, counselors, pharmacists, nutritionists) with the knowledge, skills and attitudes to effectively prevent, actively diagnose, provide care and treat HIV disease in children, including safe and effective delivery of ART in the context of a comprehensive public health approach in Tanzania
- To sensitize participants towards organization and planning for Paediatric care and treatment services at facility level

Training/Facilitation Methodologies
This is an interactive 6-days course based on the principles of adult learning. It includes:

- Lecture discussion
- Case studies
- Large and small group discussion
- Practicum
- Role Play

Course Organization
The course is organized in 11 modules namely:

- Module 1: Overview of HIV in Children
- Module 2: Diagnosis and Staging of HIV Disease
- Module 3: Paediatric HIV-related Diseases
- Module 4: Introduction to Antiretroviral Therapy
- Module 5: Adherence to Medication for Children and Adolescents
- Module 6: Adolescent HIV Services
- Module 7: Psychosocial Support Issues in Paediatric HIV
- Module 8: Prevention of HIV in children
- Module 9: HIV and Primary Health Care
- Module 10: Setting Up Comprehensive HIV Services for Children
- Module 11:Practicum

Course Materials
This package contains the following course materials:

- Participant Handbook, which includes all handouts, the participant manual contains copies of all of the PowerPoints and handouts that are necessary for this training.
- PowerPoint Slides

Performance Assessment
Your performance will be assessed through:

- Pre test
- Daily feedback using daily evaluation form
- End of workshop Evaluation: An overall rating for the course at the end of the workshop using an end of workshop evaluation form.

Your feedback is valued and appreciated

Ground Rules/Norms
"Ground rules" are expectations of both the participants and the trainers on what they should do to help the training go smoothly and meet the course objectives. Or is an agreement between trainers and participants for how this training will be conducted. The ground rule paper will be posted on the wall, to be used throughout the training and new rules would be added to the training as needed.

The importance of the ground rules is that it helps to manage the training, which requires group commitment to abide by ground rules throughout the course.

Parking Lot
Is a place to put "or park" items such as questions, concerns, or topics that:

- Require extra time
- Are related to the training but not critical
- Things that require follow up

These items can be dealt with during breaks, lunch, evenings or at the end of the training

The parking lot is a way of acknowledging and recording discussions themes or ideas that might take too much time to fully explore, or are related to, but not critical for, the discussion. These topics are usually important to the participant.

NOTE: Every training should start with similar elements to this training including: introductions, learning objectives, course overview, ground rules/norms and a parking lot.

Housekeeping
Housekeeping issues include:

- Timings of the training
- Locations of:
  - Toilets
  - Lunch and tea room
- Payment of per diems and bus fare

Key Points to Remember Throughout Training

- You already know a lot about training
- You have much to share with others
- Ask questions throughout this workshop
- We are here to guide you on how to provide care and treatment to children infected with HIV more effectively

Pre/Post Test

Each one of you will be required to complete this assignment. A pre- and post-course assessment will be used to assess your learning during the workshop.

Module 1: Overview of HIV in Children

Session 1: Epidemiology of Paediatric HIV Infection

Total Session Time: 45 minutes

Learning Objectives

By the end of this session, participants will be able to:
- Describe the burden of paediatric HIV disease
- Explain modes of HIV transmission in children
- Describe the impact of the HIV epidemic on children

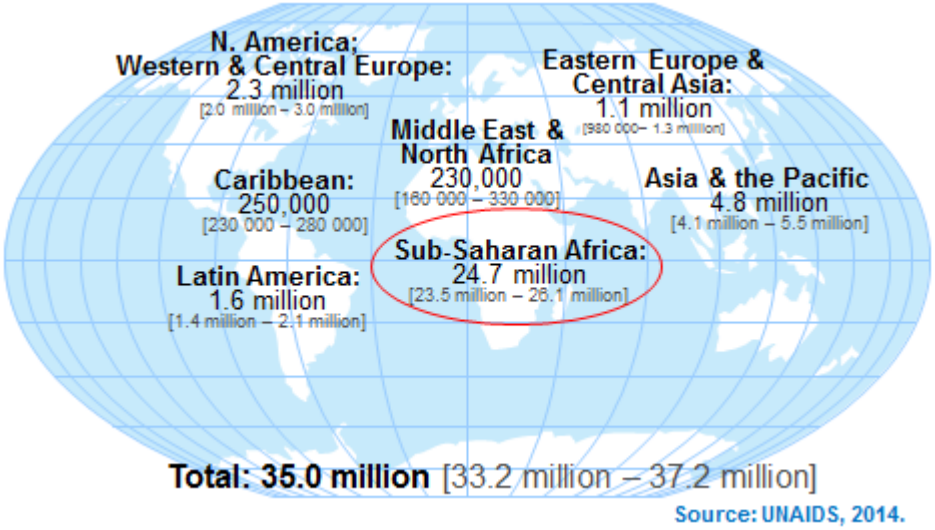
Burden of Paediatric HIV Disease

Global Summary of the AIDS Epidemic–2013

No. of people living with HIV in 2013	**Total**	**35.0 million**	[33.1 – 37.2]
	Adults	31.8 million	[30.1 – 33.7]
	Women	16.0 million	[15.2 – 16.9]
	Children (<15 yrs)	3.2 million	[2.9 – 3.5]
People newly infected with HIV in 2013	**Total**	**2.1 million**	[1.9 – 2.4]
	Adults	1.9 million	[1.7 – 2.1]
	Children (<15 yrs)	240,000	[210,000 – 280,000]
AIDS deaths in 2013	**Total**	**1.5 million**	[1.4 – 1.7]
	Adults	1.3 million	[1.2 – 1.5]
	Children (<15 yrs)	190,000	[170,000 – 220,000]

NOTE that:
- Since the beginning of the epidemic, almost 78 million people have been infected with the HIV virus.
- Approximately 39 million people have died of HIV.
- Globally, 35.0 million people were living with HIV at the end of 2013. (Estimate ranges between 33.2–37.2 million.)

Adults and Children Estimated to be Living with HIV-2013



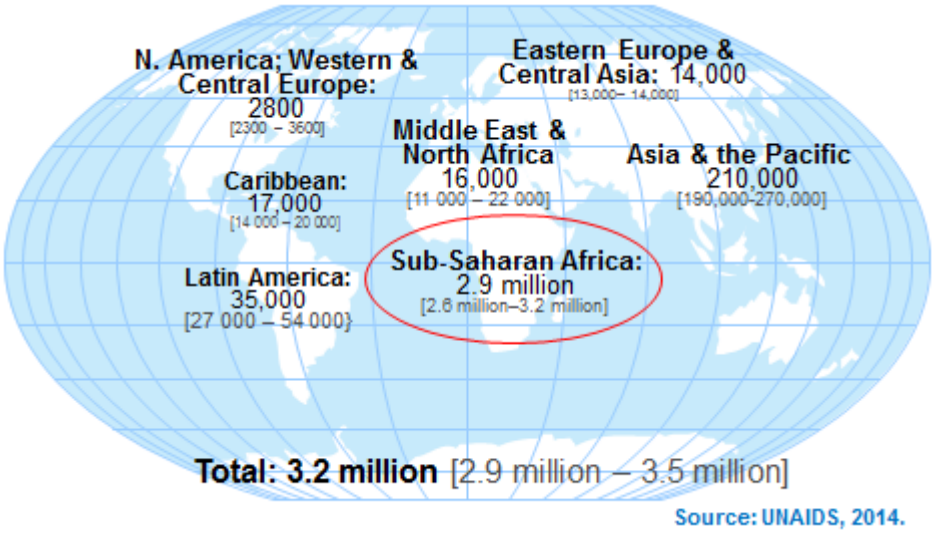
Global HIV & AIDS Estimates among Children (<15 years)-2013

Some of the key figures shown in the maps above include:

- **Children living with HIV:** 3.2 million *[2.9 million – 3.5 million]*
- **New HIV infections in 2013:** 240,000*[210,000 – 280,000]*
- **Deaths due to AIDS in 2013**: 190,000 *[170 000 – 220 000]*
- Globally, new HIV infections in children have declined by 52% between 2001 and 2012

On a global scale, much progress has been made in reducing HIV infection in children; however, the burden of HIV among children in sub-Saharan Africa continues to be high.

Children (<15 years) Estimated to be Living with HIV - 2013



The world map above indicates the extent of paediatric HIV and AIDS. The majority of children living with HIV are in sub-Saharan Africa.

HIV and AIDS in Tanzania: 2013 UNAIDS Estimates

Total Population	**45,000,000**
People Living with HIV and AIDS	**1,400,000** [1,300,000-1,500,000]
Adults (15-49 yrs) prevalence rate	**5.0%** [4.6% - 5.3%]
Adults (15 and up) living with HIV	**1,200,000** [1,100,000 -1,300,000]
Women (15 and up) living with HIV	**690,000** [640,000 - 750,000]
Children (0-14 yrs) living with HIV	**250,000** [210,000 - 280,000]
Deaths due to AIDS	**78,000** [69,000 - 90,000]
Orphans due to AIDS (age 0-17 yrs)	**1,300,000** [1,200,000 -1,500,000

New HIV Infections per Day-2013

The rate of HIV infection in adolescent is not declining unlike in other groups, For example:

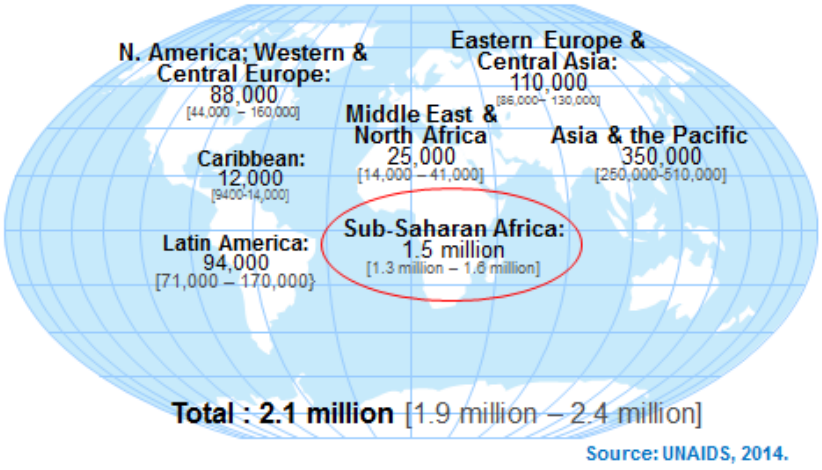
- In 2013, it is estimated that there were about 6,000 new HIV infections per day
- About 68% were in Sub Saharan Africa
- About 700 were in children under 15 years of age
- About 5,200 were in adults aged 15 years and older, of whom almost 47% were among women, and about 33% were among young people (15-24).

New HIV Infections in Children: Sub-Saharan Africa

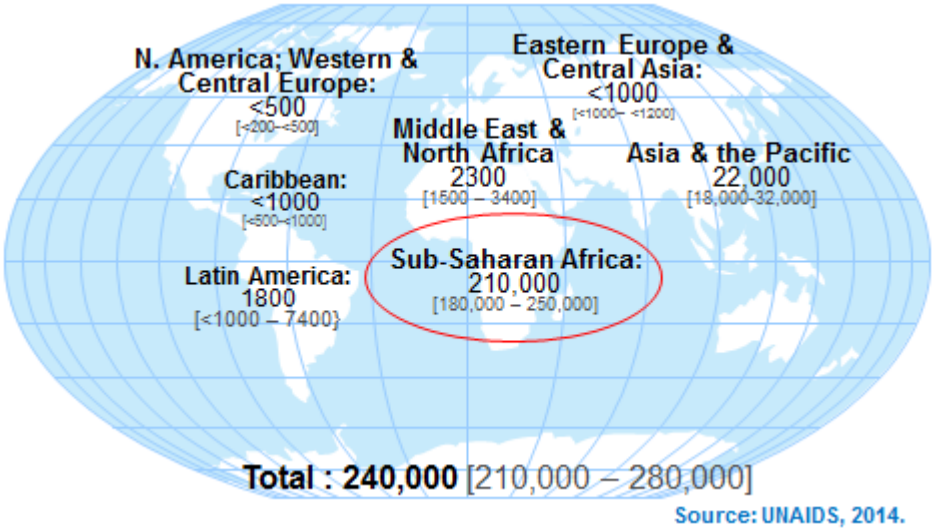
The majority of new HIV infections in children (0-14 yrs) are in sub-Saharan Africa;

- 52% of new infections occurring in East & Southern Africa (approx. 130,000)
- 37% of new infections occurring in West & Central Africa (approx. 98,000)

Estimated Number of Adults and Children Newly Infected with HIV-2013



Estimated Number of Children (<15 years) Newly Infected with HIV-2013



Factors Contributing to High Prevalence of HIV in Children in Sub Saharan Africa
Many children are infected because of high prevalence among women and low coverage of PMTCT. High prevalence of infection in women of childbearing age:

- Biological and cultural factors
- Early age of sexual initiation
- Older sexual partners

Low coverage and efficiency of PMTCT programs where infection rates among women (15-49 yrs) is high.

Other cultural, traditional and social factors that increase women's risk of becoming infected with HIV include:

- Early marriages
- Lack of sex education
- Traditional male attitudes about sex
- Coercion by men who have multiple sexual partners
- Failure to seek treatment for sexually transmitted infections (STIs)
- Traditional practices like cleansing of widows
- Peer pressure for young women to engage in unsafe sexual practices
- Inability of women to negotiate safer sex because of economic dependence or powerlessness in their relationships

NOTE: Of these, lack of access to ART is one of the most important factors.

Modes of HIV Transmission in Children & Impact of the HIV Epidemic on Children

Modes of HIV Transmission in Children
More than 95% of HIV-infected infants in Africa acquire HIV from their mothers during pregnancy, at the time of delivery, or postnatal through breast-feeding. Without any

intervention, between 30 and 40% of breast-feeding HIV-positive women transmit HIV to their newborns.
Children may become infected with HIV through several potential modes of transmission. These include:

- **MTCT** (pregnancy, delivery, or breastfeeding). This accounts for approx. 90% of HIV infection in children
- **Sexual transmission** (among adolescents; child sexual abuse)
- **Unsterile injections** (2.5% in both adult and paediatric population)
- **Unsterile procedures** in the community (e.g. scarification, uvulectomy, traditional circumcision)
- **Transfusion of infected blood** and blood products

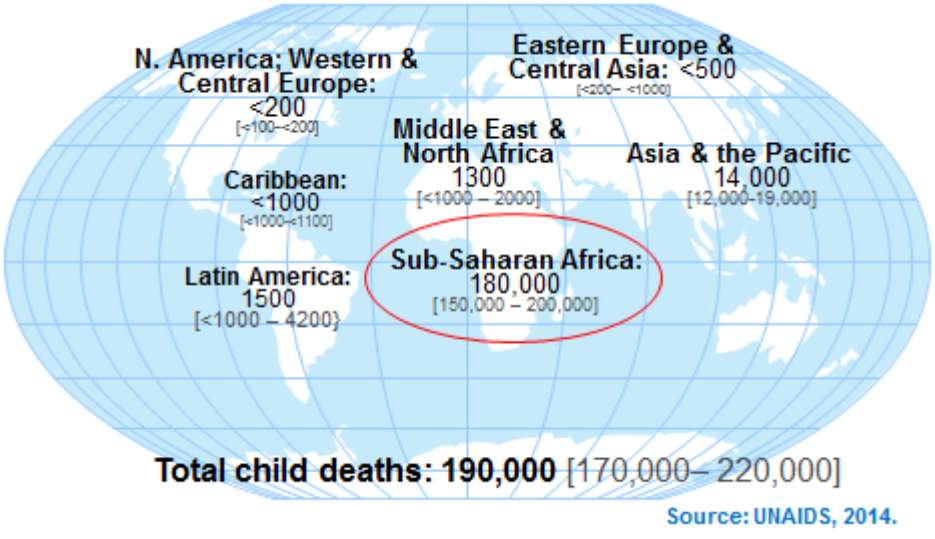
*Refer to **Handout 1.1.1: Modes of HIV Transmission in Children** on **page 7** for more information.*

Impact of HIV in Children
Impacts of the HIV epidemic on children include:

- Increased infant and childhood morbidity and mortality
- Increase in number of orphaned children; It is estimated that 1.3 million orphans are due to AIDS in Tanzania (UNAIDS, 2013)
- Increased deprivations in various forms such as mental, psychological, and school dropouts. When a mother dies, the household will be at risk collapsing completely, leaving children to look after themselves. The older children, especially girls, will be taken out of school to work in the home or the farm. These girls, deprived of education and opportunities, will be even less able to protect themselves against AIDS.
- Child abuse: Physical, Sexual

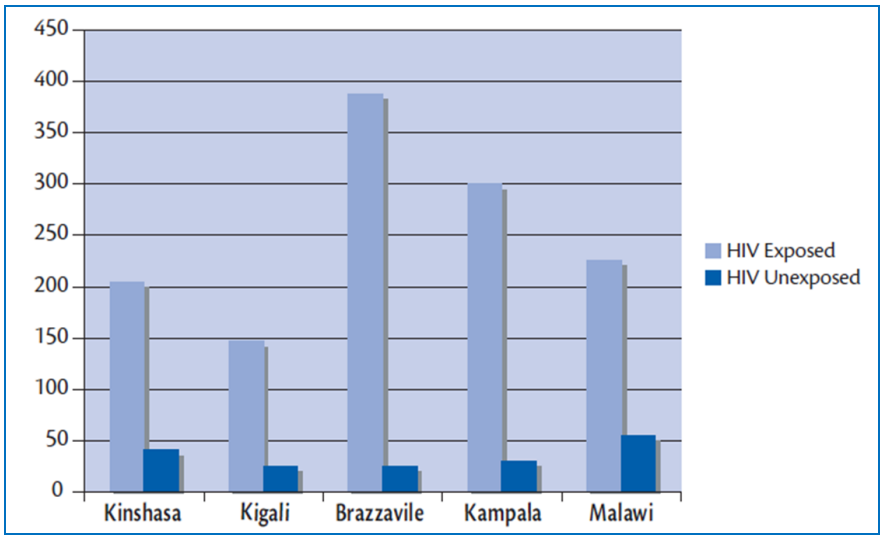
Generally, with the deepening poverty that results from sick and dying parents, children are the first to suffer. They suffer mental, psychological, and social distress and increasing material hardships. The children may be the only caregivers for their sick or dying **parents**, may drop out of or interrupt school, and are at risk of discrimination and abuse, both physical and sexual.

Estimated Deaths in Children (<15 Years) from AIDS - 2013



NOTE that: Children accounted for almost 12.7% of the 1.5 million AIDS deaths in 2013 across the world. Majority of deaths (94.7%) occurred in sub-Saharan Africa.

Infant Mortality Rates in HIV Exposed and Unexposed Babies in Africa
Demographic data from sub-Saharan Africa clearly show the impact of HIV on childhood mortality. This figure shows that the mortality rate in HIV-exposed infants is several times higher than that in non exposed infants.



Key Points

- Over the past 3 decades HIV has spread worldwide with devastating consequences, particularly in Sub-Saharan Africa
- MTCT accounts for the highest mode of transmission of HIV infection in children
- The burden of HIV and AIDS among Tanzanian children is high

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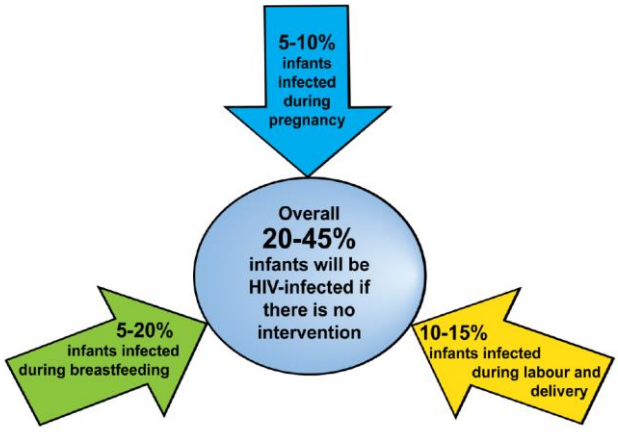
Handout 1.1.1: Modes of HIV Transmission in Children

Children may become infected with HIV through several potential modes of transmission. These include:

- Mother-to-child transmission of HIV
  - Approximately 90 per cent of HIV infections in infants and children were passed on by their mothers during pregnancy, delivery or breastfeeding. (UNICEF)[1]
- Sexual transmission among adolescents
- Sexual abuse of children
- Transfusion of infected blood or blood products
- Unsterile injection procedures, including unsafe injections in a health-care setting or unsafe injection drug use
- Unsterile procedures in the community like male circumcision
- Unlawful female genital mutilation
- Scarification.

Mother-to-child transmission (MTCT) of HIV refers to the transmission of HIV infection from HIV-infected mothers to their infants. MTCT can occur during pregnancy, labour and delivery and breastfeeding. Without intervention, the overall risk of MTCT is approximately 20% to 45%. (MOHSW/NACP, 2012)[2]

Figure 1: Estimated HIV Outcomes for Infants born to Women Living with HIV



MOHSW/NACP, 2012[2]

The uptake of PMTCT intervention is still low in Tanzania, as well as in other developing countries. It is very important to encourage pregnant women to get tested for HIV in order to prevent mother to child transmission.

Young women and girls are heavily affected by HIV and AIDS. 2012 estimates indicate that there were 2.1 million adolescents aged 10-19 years living with HIV in sub-Saharan Africa; of these, 58% are female. (Idele et al, 2014)[3] Global UNAIDS estimates for 2013 indicate approximately 6,000 new HIV infections daily, including 700 children. Approximately 33% of new infections daily are among young people ages 15-24. Our obligations as health care providers extend towards an advocacy role in addressing the needs of children.

Session 2: Biology of the Human Immunodeficiency Virus

Total Session Time: 1 hour

Learning Objectives

By the end of this session, participants will be able to:
- Explain classification of HIV
- Describe the basic structure of HIV
- Explain the HIV evolution and replication cycle

Classification & Basic Structure of HIV

Classification of Human Immunodeficiency Virus (HIV)
Retroviruses (Family Retroviridae):
These are enveloped, single stranded RNA viruses that replicate through a double stranded DNA intermediate using Reverse transcriptase. Reverse Transcriptase lacks proof reading function with high potential for genetic diversity.

HIV belongs to the family of Retroviridae which have an unusual life cycle that requires transcription of RNA to DNA-hence "retro" or backwards through the use of an enzyme known as reverse transcriptase. HIV and other retroviruses are capable of producing deoxyribonucleic acid (DNA) from RNA, whereas most cells carry out the opposite process, transcribing the genetic material of DNA into RNA.

The activity of the enzyme enables the genetic information of HIV to become integrated permanently into the genome (chromosomes) of a host cell.

Isolates: HIV-1 and HIV-2. Can remain dormant within a cell for many years, especially in resting (memory) CD4+ T4 lymphocyte, HIV is a highly variable virus which mutates very readily. This means there are many different strains of HIV, even within the body of a single infected person. Based on genetic similarities, the numerous virus strains may be classified into types, groups and subtypes. This explains the challenges of development of vaccine.

There are two types of HIV:
- HIV-1 Virus
- HIV-2 Virus

Both types are transmitted by sexual contact, through blood, and from mother to child, and they appear to cause clinically indistinguishable AIDS. However, it seems that HIV-2 is less easily transmitted, and the period between initial infection and illness is longer in the case of HIV-2. Worldwide, the predominant virus is HIV-1, and generally when people refer to HIV without specifying the type of virus they will be referring to HIV-1. The relatively uncommon HIV-2 type is concentrated in West Africa and is rarely found elsewhere.

For example

HIV-1	HIV-2
• Is found worldwide • Is the main cause of the worldwide pandemic • Commonly found in Tanzania	• Mainly found in West Africa, Mozambique and Angola • Causes a similar illness to HIV-1 • Less efficiently transmissible • Rarely causes vertical transmission • Less aggressive, slower disease progression

*Refer to **Handout 1.2.1: Types of Human Immunodeficiency Virus** on **page 15** for more information on the types of HIV.*

HIV-1 Groups and Subtypes and Geographic Distribution

HIV-1 groups;

- M (major): cause of current worldwide epidemic
- O (outlier) and N (Cameroon): rare HIV-1 groups that arose separately

HIV-1 is subdivided into two different groups: M and O. Sub-Group M can be further subdivided into subtypes based on genetic sequence data. Some of the subtypes are known to be more virulent or are resistant to different medications. One of the obstacles to treatment of the HIV is its high genetic variability.

HIV-1 M subtypes (clades);

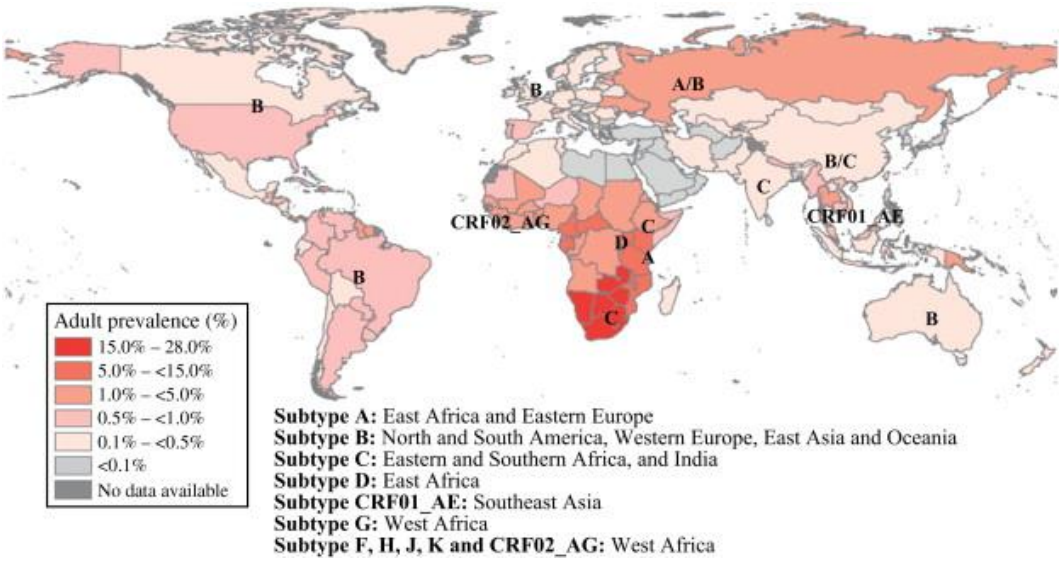
- >10 identified (named with letters A to K)
- Descended from common HIV ancestor
- One clade tends to dominate in a geographic region
- Clades differ from each other genetically
- Different clades have different clinical and biologic behavior

HIV-1 M subgroups (clades):

- A-E are the predominant subtypes
- C is the most virulent subtype;
  - Higher transcription rates
  - Higher rates of MTCT
  - Faster disease progression in adults

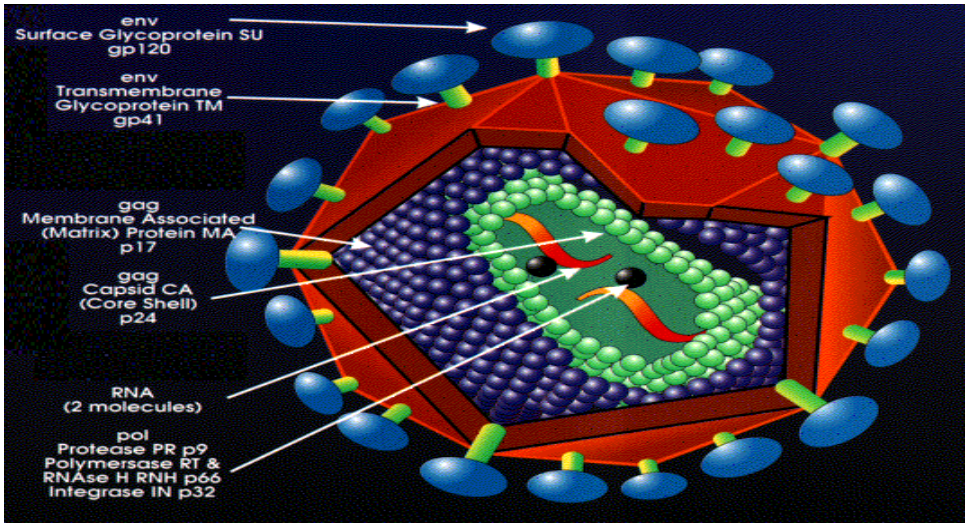
*Refer to **Handout 1.2.2: HIV-1 Subtype Distribution in Africa** on **page 17** for more information on HIV-1 Subtype Distribution in Africa and world wide*

Global Distribution of HIV Sub-Types
The geographic distribution of HIV sub-types using the map.



Subtype A: East Africa and Eastern Europe
Subtype B: North and South America, Western Europe, East Asia and Oceania
Subtype C: Eastern and Southern Africa, and India
Subtype D: East Africa
Subtype CRF01_AE: Southeast Asia
Subtype G: West Africa
Subtype F, H, J, K and CRF02_AG: West Africa

Structure of HIV
HIV is roughly spherical and about one ten-thousandth of a millimeter across. Its outer envelope is made of a double layer of lipid envelope that bears numerous spikes. Beneath the envelope is a layer of matrix protein (p17) that surrounds the core (capsid). It has two copies of positive single stranded RNA.



This photo is the phenotype (or physical appearance/structure) of HIV. HIV's basic structure is composed of the following proteins:

- Envelope glycoprotein (gp 120 and gp 41)
- Membrane proteins (p17)
- Capsid proteins (p24)
- Genetic material (RNA) and
- Three types of enzymes (Reverse transcriptase, Integrase and Protease)

*Refer to **Handout 1.2.3: Structure of HIV** on page **19** for more information on the structure of HIV.*

HIV Evolution and Replication Cycle

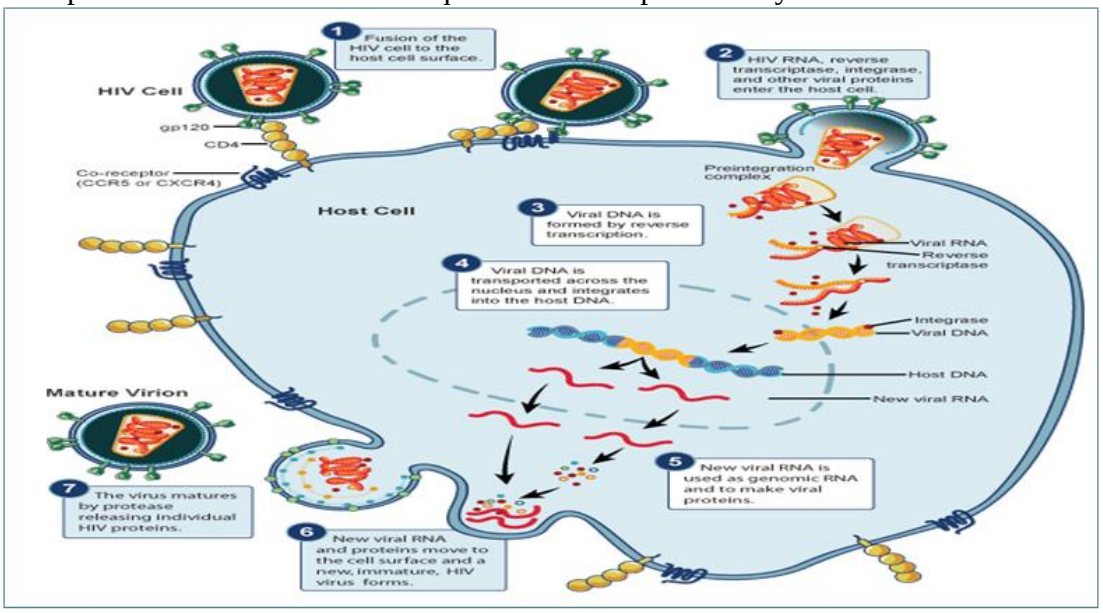
Viral Replication Cycle

There are six HIV replication steps that occur in human host T-lymphocyte cells:

1. Binding and Fusion
2. Reverse Transcription
3. Integration
4. Transcription
5. Assembly
6. Budding

Studies have also identified multiple co-receptors for different types of HIV strains. These co-receptors are promising targets for new anti-HIV drugs, some of which are now being tested in preclinical and clinical studies. Agents that block the co-receptors are showing particular promise as potential microbicides that could be used in gels or creams to prevent HIV transmission.

This photo below describes the sequence of the replication cycle:



Video on HIV Replication

Follow instruction provided by facilitator about the video on replication cycle.

Implications of Viral Replication

An average of HIV-1 generation time is 2.6 days. This is the time from release of a virion until it infects another cell. Productively infected cells are estimated to have average life-span of 2.2 days (half-life (t 1/2) = 1.6 days). Life span of the virus once outside the body is 20min; the virus will die once the blood droplet dries.

In untreated patients, average total HIV-1 production is >10 billion virions /day. High rate of replication results in mistakes in transcription resulting in the high genetic diversity of the virus. This means that high rate of viral replication promote development of viral resistance and a negative impact on the production of an effective vaccine. Thus, the CD4 cells are often destroyed by HIV virus infection and replication, resulting in profound immunodeficiency.

Key Points

- HIV-1 is responsible for the current pandemic
- Knowing the structure and function of HIV is essential to understanding its impact on an infected cell
- Rapid replication of HIV causes genetic diversity of the virus

Handout 1.2.1: Types of Human Immunodeficiency Virus

There are only two well-studied and understood HIV Virus types:

- HIV-1 virus
- HIV-2 Virus

HIV Type 1 is found worldwide and is the main cause of AIDS global pandemic. The second type of Virus, HIV-2 has not been widely seen outside of Africa. It is mainly found in Western Africa, Mozambique and Angolan parts of African continent. The HIV-2causes an illness similar to HIV-1. Nonetheless, this virus is less transmissible and less aggressive. It is rarely transmitted vertically and progresses slowly as compared to HIV-1, although HIV-2 is known to cause AIDS.

HIV-1 is related to viruses found in chimpanzees and gorillas living in western Africa, while HIV-2 viruses are related to viruses found in sooty mangabeys.

Within the retrovirus family, HIV belongs to a subgroup known as lentiviruses, or "slow" viruses. Lentiviruses are known for having a long time period between initial infection and the beginning of serious symptoms. This is why there are many people who are unaware of their HIV infection, and unfortunately, can spread the virus to others.

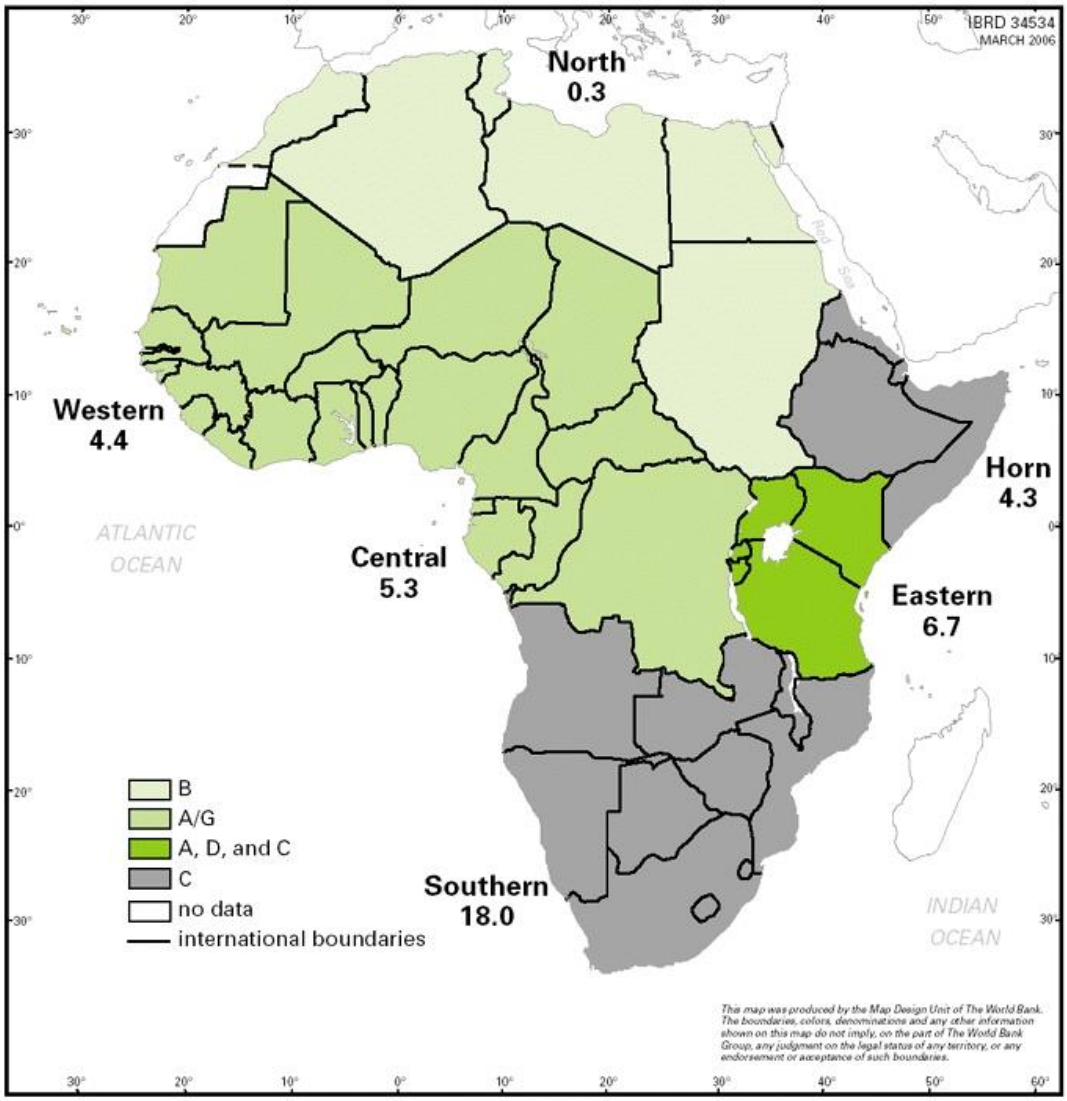
Similar versions of HIV infect other nonhuman species, such as feline immunodeficiency virus (FIV) in cats and simian immunodeficiency virus (SIV) in monkeys and other nonhuman primates. Like HIV in humans, these animal viruses primarily infect immune system cells, often causing immune deficiency and AIDS-like symptoms. These viruses and their hosts have provided researchers with useful, although imperfect, models of the HIV disease process in people.

Handout 1.2.2: HIV-1 Subtype Distribution in Africa and World wide

Some studies have indicated that, with the exception of sub-Saharan Africa, where almost all HIV-1 subtypes, are detected, there is a specific geographic distribution pattern of HIV-1 subtypes. This seems to be the consequence of either accidental trafficking (viral migration), with a resulting "founder" effect, or a prevalent route of transmission, resulting in a strong advantage and local predominance of the subtype prevalently transmitted in that population.

The most prevalent HIV-1 genetic forms are subtypes A, B, C, with the latter accounting for almost over 80% of all global HIV-1 infections worldwide. In particular, subtype A viruses are predominant in areas of central and eastern Africa (Kenya, Uganda, Tanzania, and Rwanda). Subtype B is the main genetic form in several countries of northern Africa and among South African homosexual men.

MAP OF AFRICA SHOWING HIV-1 SUBTYPE DISTRIBUTION



- Subtype A is common in West Africa.
- Subtype B is the dominant form in Europe, the Americas, Japan, Thailand, and Australia.
- Subtype C is the dominant form in Southern Africa, India, and Nepal.
- Subtype D is generally only seen in Eastern and central Africa.
- (Subtype E) has never been identified as a nonrecombinant, only recombined with subtype A as CRF01_AE.
- Subtype F has been found in central Africa, South America and Eastern Europe.
- Subtype G (and the CRF02_AG) have been found in Africa and central Europe.
- Subtype H is limited to central Africa.
- (Subtype I) was originally used to describe a strain that is now accounted for as CRF04_cpx, with the cpx for a "complex" recombination of several subtypes.
- Subtype J is primarily found in North, Central and West Africa, and the Caribbean
- Subtype K is limited to the Democratic Republic of Congo and Cameroon.

NOTE:
- East Africa has a mix of subtypes A, C and D
- Southern Africa contains mainly subtype C
- West and Central Africa primarily have subtype A.
- Different subtypes can combine to form diverse recombinants.

Source:
Disease and Mortality in Sub-Saharan Africa.2nd edition.Jamison DT, Feachem RG, Makgoba MW, et al., editors. Washington (DC): World Bank; 2006. Chapter 17: HIV/AIDS)

Handout 1.2.3: Structure of HIV

The outer coat of the virus:
This is known as the viral envelope, is composed of two layers of fatty molecules called lipids, taken from the membrane of a human cell when a newly formed virus particle buds from the cell.

Evidence indicates that HIV may enter and exit cells through special areas of the cell membrane known as 'lipid rafts'. These rafts are high in cholesterol and glycolipids and may provide a new target for blocking HIV.

Embedded in the viral envelope are proteins from the host cell, as well as 72 copies (on average) of a complex HIV protein (frequently called "spikes" that protrudes through the surface of the virus particle (virion). This protein, known as Env, consists of a cap made of three molecules called glycoprotein (gp) 120, and a stem consisting of three gp41 molecules that anchor the structure in the viral envelope. Much of the research to develop a vaccine against HIV has focused on these envelope proteins.

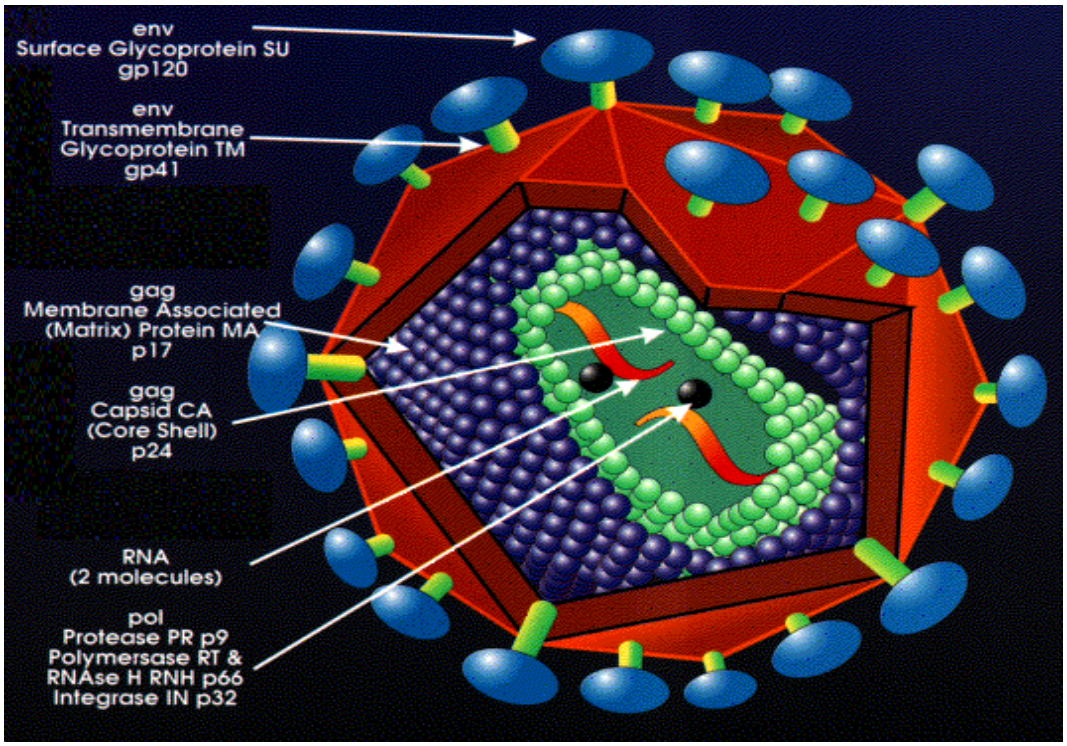
The viral core:
Within the envelope of a mature HIV particle is a bullet-shaped core or capsid, made of 2,000 copies of another viral protein, p24.

The capsid surrounds two single strands of HIV RNA, each of which has a copy of the virus's nine genes. Three of these genes, gag, pol, and env, contain information needed to make structural proteins for new virus particles. The gag gene codes for a precursor protein that can be cleaved by the viral protease into four smaller proteins: p24 (capsid), p17 (matrix), p7 (nucleocapsid), and p6.

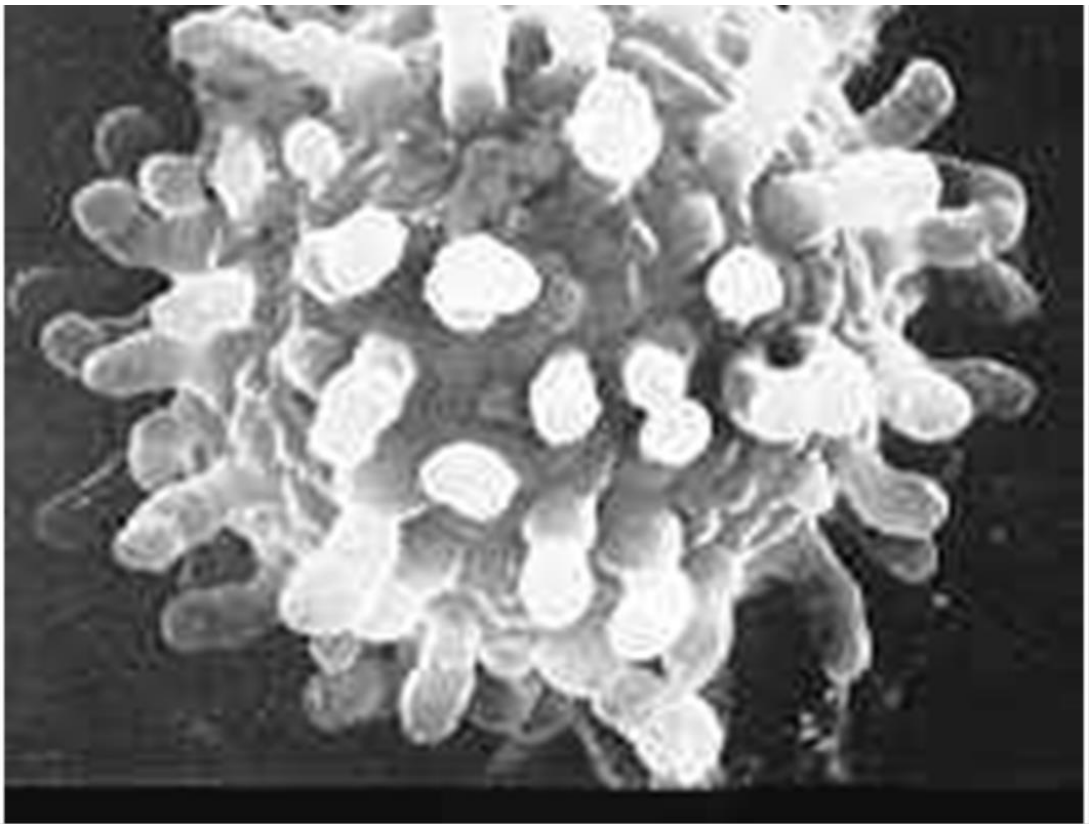
The pol gene codes for a precursor protein that contain four enzymes: protease, integrase, RNase H, and reverse transcriptase. The env gene codes for a protein called gp160 that is broken down by the viral protease to form gp120 and gp41, the components of Env.

Continued on next page

HIV-1 PARTICLE



A model representation of the HIV viron (particile) and its associated proteins



(HIV-1 Viral particle outlook at higher magnification of an electron microscope)

Session 3: Pathophysiology and Natural History of HIV Infection in Children

Total Session Time: 1 hour

Learning Objectives

At the end of this session, participants will be able to:
- Describe the cells involved in the immune system
- Explain the effect of HIV on the immune system
- Describe the immunologic and virologic parameters of HIV infection
- Explain clinical disease progression in children

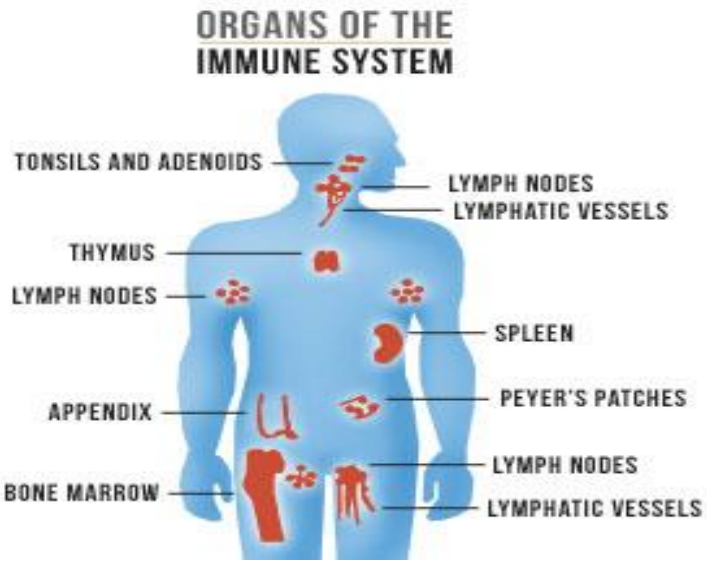
Cells of the Immune System & Effect of HIV on the Immune System

Cells of the Immune System

The cells of the immune system in the body can be found in blood and tissues:
- Blood, such as white blood cells
- Tissues;
  - Dendritic cells (brain)
  - Langerhan's cells (skin, lungs, intestines)
  - Macrophages (lungs, liver, brain, kidneys)

Distribution of Lymphoid (Immune) Tissues in the Body

This picture shows the distribution of the lymphoid tissue in the body.



White Blood Cells

These are cells of the immune system involved in defending the body against both infectious diseases and foreign materials. The types of the white blood cells include:
- Macrophages: acting as clearing cells

- Neutrophils: attack bacteria
- Eosinophils: attack helminths and mediate allergies
- Lymphocytes:
  - B-lymphocytes (B cells)- making antibodies
  - T-lymphocytes (T cells) - responsible for attacking viruses, fungi and some bacteria

*Refer to **Handout 1.3.1: White Blood Cells** on **page 27** for more information on white blood cells.*

Blood Lymphocytes

There are 3 types Lymphocytes that protect a host:

- **T cells**: comprising of 70-80% are processed in the thymus: The T cells are of T helper (CD4+) cells and T killer/cytotoxic (CD8+) cells
- **B cells:** comprising 5-15% are formed in bone marrow and produce antibodies after exposure to an antigen
- **Natural Killer (NK) cells:** consisting of 15% and also destroy infected cells

NOTE that: **Regulator cells** also known as **helper** or **CD4 cells** ("generals" in army of immune system which recognize "invaders" and summon armies of cells to mount a direct attack).
Fighter or **effector cells** also known as **cytotoxic** or **CD8 cells** (bind directly to antigen and destroy it).

*Refer to **Handout 1.3.2: Blood Lymphocytes** on **page 29** for more information on Lymphocytes.*

Effect of HIV on the Immune System

HIV attaches to cells of the immune system with special surface markers called CD4 receptors: Thus the immune cells with CD4 receptors include T-lymphocytes and dendritic cells. CD4+ T cells also serve as important reservoirs of HIV; a small proportion of these cells harbor HIV in a stable, inactive form. Therefore, HIV targets the cells of the immune system (called lymphocytes), specifically CD4+ cells.

Other immune cells with and without CD4 molecules on their surfaces are infected as well: Among these are monocytes and macrophages, which can harbor large quantities of the virus without being killed, thus acting as reservoir of HIV. Normal immune processes may activate these cells, resulting in the production of new HIV virions.

The hallmark of HIV disease is profound immunodeficiency as a result of depletion of CD4+ T lymphocytes. Despite vigorous immune system response to HIV infection, including antibody production, it is unable to eradicate the virus from the body. By attacking the cells of the immune system, HIV infection leads to a decreased ability to fight off both HIV and other infections.

The CD4+ T cell dysfunction is from:

- Reduction in numbers
- Impairment in function

When cell-mediated immunity is lost as a result of CD4 dysfunction, AIDS develops. This reduces the capacity of the body to fight infectious diseases.

Individuals with HIV infection are therefore increasingly susceptible to many infections, especially at later stages of HIV disease. Opportunistic infections (OIs) and conditions affecting patients with advanced HIV do not normally affect people with healthily functioning immune systems, but they can have devastating effects in HIV-positive people.

Thus, the effects of HIV on the immune system include:

- Lymphoid tissue destruction
- CD8+ cell dysfunction
- B cell abnormalities
- Thymic dysfunction
- Autoimmune abnormalities such as psoriasis, rheumatoid arthritis and other skin conditions

Immunologic and Virologic Parameters of HIV Infection & Clinical Disease Progression in Children

Immunologic and Virologic Parameters of HIV Infection

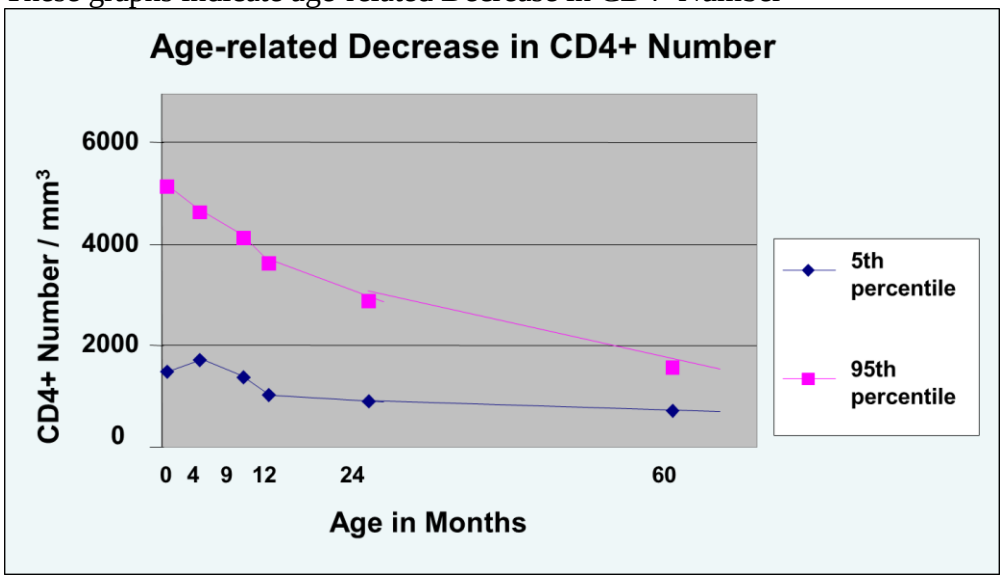
Age-CD4 Relation

In considering the results of immunological parameters, age must be taken into account as a variable as follow:

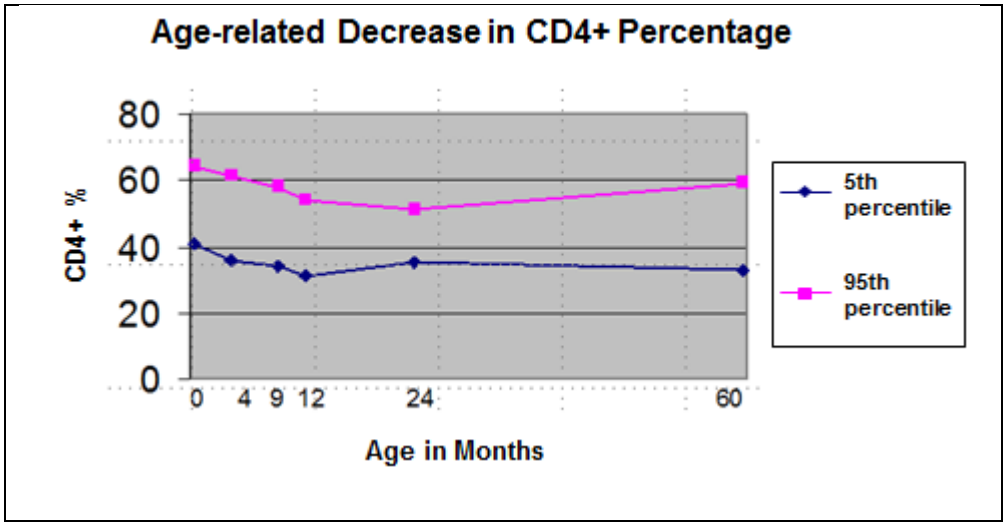
Absolute CD4 count varies with age, being higher in healthy children than in adults. The normal absolute CD4 counts slowly decline to adult levels by 6 years of age. CD4 percentages vary less with age. In children less than 5 years of age the absolute CD4 count tends to vary within an individual child more than CD4 percentage. For example, in children < 5 years, CD4 percentage is the preferred immunological parameter for monitoring HIV disease progression.

Currently, therefore, the measurement of CD4 percentage is thought to be more valuable in children under 5 years of age.

These graphs indicate age-related Decrease in CD4+Number



Basically, 95th percentile means 95% of the time, the usage or occurrence is below this amount. Conversely, 5% of the time is above this amount.



95th percentile is a good number to use for planning so you can ensure that you have the needed bandwidth at least 95% of the time.

Natural History: Immunologic Parameters in HIV Infection

At the time of infection, HIV enters the body and starts to multiply rapidly in CD4 cells. These HIV-infected CD4 cells then release large amounts of virus into the blood stream so that HIV can infect other CD4 cells and for a short while the number of CD4 cells may drop.

Then, the body responds after a few weeks by producing antibodies to control the virus. This results in decrease in viral load and increase in CD4 cells after a few months. With disease progression, the CD4 cells continue to be infected and killed, therefore the CD4 count and percentage decline. CD4 values < 25% is associated with AIDS or death. Prognosis is poorer in infants.

NOTE that: as a result of immune response early in the infection, the amount of HIV in the body decreases and the number of CD4 cells increases **BUT** as the CD4 cells continue to be infected and killed and that the number of CD4 cells eventually starts to fall and the function of the immune system begins to fail. As a result, the rate of HIV multiplication rises again and the amount of virus in the blood slowly increases once more.

The CD4 count or percentage value along with clinical indicators is used to guide antiretroviral treatment decisions:

- CD4 values can be associated with considerable intra-patient variation
- Transient decreases may be associated with concurrent illnesses & vaccinations
- CD4 values are best measured when patients are clinically stable

Absolute CD4 counts and, to a lesser extent, CD4 percentage values, fluctuate within an individual and values can vary with:

- Concurrent illness
- Physiological changes
- Timing of test or test variability

Serial measurements are more informative than individual values and also reflect trends over time.

Natural History: Virologic Parameters

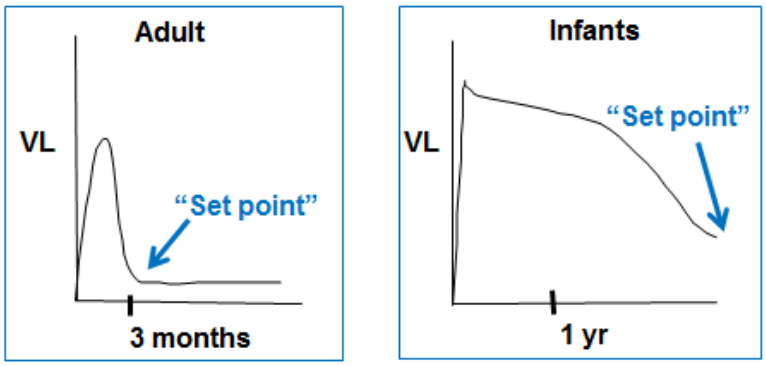
Perinatal period is the period from 28 weeks of gestation to 7 days of life. RNA is the first viral marker detectable in acute infection. Perinatally-infected infants demonstrate:

- Low viral load at birth with rapid increase
- Peak viral load at ~2 months with values of 100,000 – 1,000,000 copies/ml
- Persistently high levels for 1-2 years with slow decline to "set point". 'Set point' is the point at which the viral load is no longer changing because viral replications have been contained by the immune system.
- Disease progression related to peak viral load

Infants with early breast-milk transmission follow pattern of perinatally-infected infants. Infants with late breast-milk transmission follow pattern of adults. Adults' exhibit:

- Peak viral load at ~2 weeks after infection with values 10,000 – 100,000 copies/ml
- Rapid decline to "set point"
- Disease progression related to set point

HIV RNA Response in Infants Compared to Adults



NOTE: Infants have *much* higher viral loads than adults

Once HIV enters the body at the time of infection, it starts to multiply rapidly in CD4 cells. These HIV-infected CD4 cells then release large amounts of virus into the blood stream and the viral load becomes very high after a short time. The body responds after a few weeks by producing antibodies in an attempt to control the virus. As a result of this immune response, the amount of HIV in the body decreases.

In adults the body responds after a short time because the body had a strong well-functioning immunity before HIV infection. In children because of the very weak premature immune system, it takes a long time for the body to respond to the infection. Therefore the viral load remains very high for a long time before it starts to decline.

This pattern is due to inability of the infant's immature immune system to contain viral replication. There is also a greater number of HIV susceptible cells, that high RNA levels and low CD4 values (<25%) are independently predictive of increased risk of progression to AIDS and death.

Children >12 months with HIV RNA >100,000 copies/ml are at higher risk for disease progression and death. Prognostic value of RNA level in infants is less than in older children

because CD4% therefore is a better prognostic indicator of risk of disease progression and death in infants.

HIV Disease Progression in Children in Africa
The progression of HIV in children in Africa is when there is no any MTCT intervention. For example;

- **Category 1** (25 – 30%):
  - Rapid disease progression; infants die within 1 year
  - Disease acquired in utero or perinatally
- **Category 2** (50 – 60%):
  - Children who develop symptoms early in life
  - Deteriorate and die by 3 to 5 years
- **Category 3** (5 – 25%):
  - Long-term survivors who live beyond 8 years of age

Factors Related to Disease Progression
Among the factors related to HIV disease progression in children include:

- HIV 1 subtype
- Maternal HIV disease status
- Child's immature immune system
- Size of infecting viral dose
- Infant peak viraemia (viral load level)
- Infant CD4% cell counts

Maternal Predictors of Infant Disease Progression

- High viral load at time of delivery
- CD4 cell count < 200 cells/mm^3
- Rapidly progressive maternal disease
- Maternal death;
  - Associated with a more than 4 fold increase in infant mortality compared to infants of mothers who survive

Key Points

- The fundamental pathology in HIV is the inability of the host immune system to get rid of the virus resulting in destruction of the immune system
- Infants have much higher viral loads than adults
- HIV viral loads of greater than 100,000 copies/ml have been associated with high levels of mortality
- CD4 values <25% are independent predictors of increased risk of progression to AIDS and death

Handout 1.3.1: White Blood Cells

The white blood cells or leukocytes are cells of the immune system involved in defending the body against both infectious diseases and foreign materials.

Macrophages are a type of white blood cells which eat foreign material in the body. These cells are involved in the primary or innate immune response to a number of immune invaders, and they also make up an important part of the body's acquired immune system. At any given time, macrophages are at work in many corners of the body, quietly cleaning up foreign debris, bacteria, and viruses before they have a chance to cause a problem. Macrophages are therefore referred as clearing cells or security guards for the immune system.

Macrophage starts out in the bone marrow as monocyte, which has the capability to mature into a macrophage when it is stimulated to do so.

When a macrophage encounters something which it thinks might be dangerous, it will engulf it and create enzymes to neutralize it so that it cannot continue replicating in the body, a process called phagocytosis.

Neutrophils are the most common type of white blood cells, comprising about 50-70% of all white blood cells. Neutrophils are the first immune cells to arrive at a site of infection, through a process known as chemotaxis.

Neutrophils are present in the bloodstream until signalled to a site of infection by chemical cues in the body. They are fast acting, arriving at the site of infection within an hour.

Eosinophils primarily deal with parasitic infections and an increase in them may indicate such. Eosinophils are also the predominant inflammatory cells in allergic reactions. The most important causes of eosinophilia include:

a. Allergies such as asthma
b. Hay fever
c. Hives
d. Parasitic infections

CD8 cells and NK cells also destroy cancerous cells and foreign (graft) cells

Handout 1.3.2: Blood Lymphocytes

The white blood cells or leukocytes are cells of the immune system involved in defending the body against both infectious diseases and foreign materials.

There are two types of lymphocytes. These are produced in the bone marrow before birth:

- *B lymphocytes*, stay within the bone marrow until they are mature. Once mature, they spread throughout the body and concentrate in the spleen and lymph nodes.
- *T lymphocytes*, leave the bone marrow and mature in the thymus.

All lymphocytes are capable of producing chemicals to fight foreign molecules. Any molecule recognized by the body as foreign is called an antigen. A lymphocyte, whether B or T, is specific for only one kind of antigen. Only when the appropriate antigen is encountered does the cell become stimulated.

There are two main types of T lymphocytes and each plays a separate role in the immune system.

- Killer T cells
- T helper cells

Killer T cells search the body for cells infected by antigens. When a killer recognizes an antigen attached to a cell of the body, it attaches itself to the surface of the infected cell. It then secretes toxic chemicals into the cell, killing both the antigen and the infected cell.
T helper cells release a chemical, called a *cytokine*, when activated by an antigen. Cytokines stimulate B lymphocytes to begin their immune response.

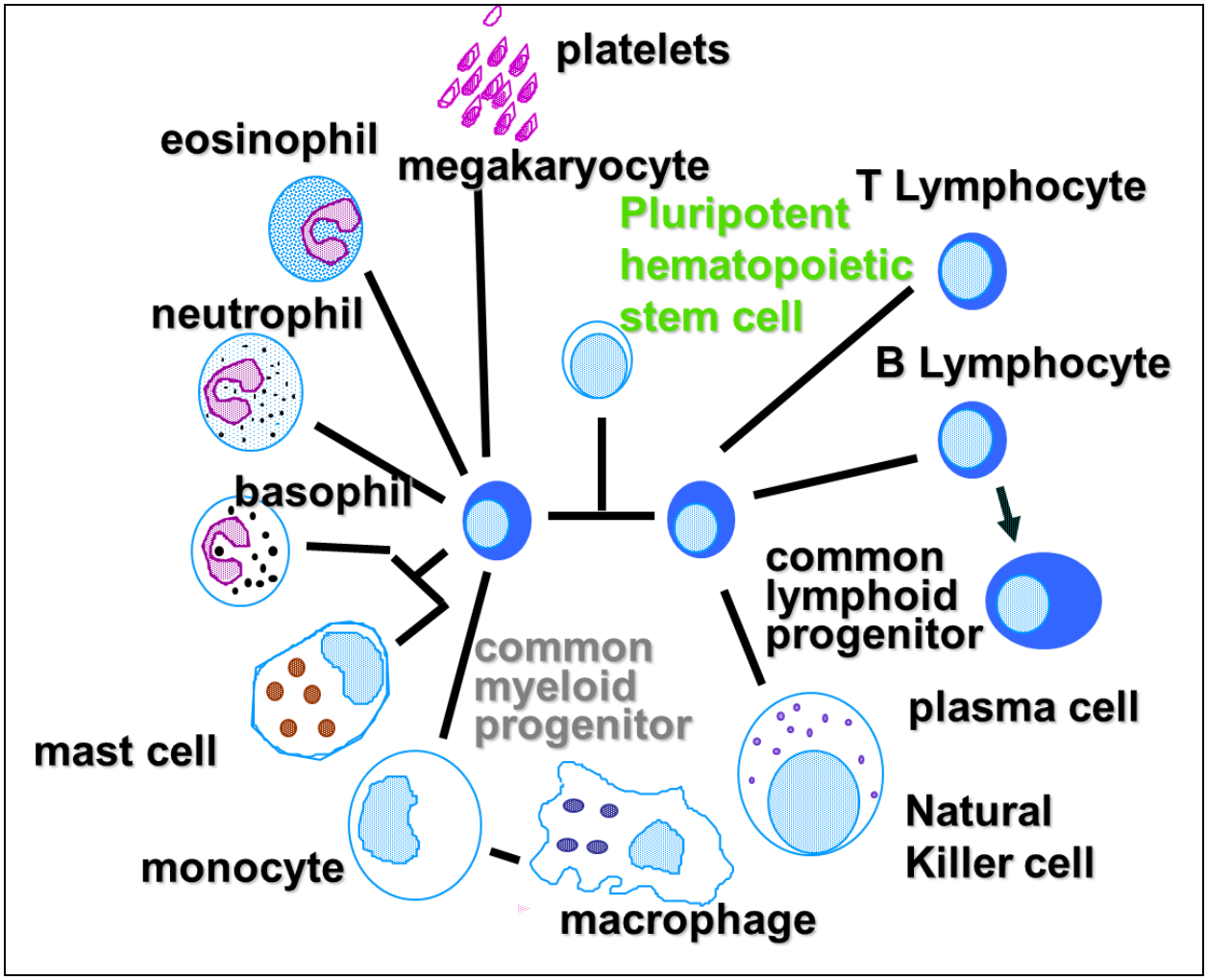
When a B cell is activated, it produces proteins that fight antigens, called *antibodies*. Antibodies are specific for only one antigen.

The first time an antigen is encountered, the primary immune response, the reaction is slow. After being stimulated by the T helper cells, the B cells begin to replicate and become either plasma cells or memory cells. Plasma cells produce antibodies to fight the antigen. Plasma cells die within a few days but the Antibodies remain in the system for a bit longer, but usually breakdown within a week. Memory cells remain in the body for much longer than plasma cells and antibodies, often years. They are important for providing immunity.

If the antigen infects the body again, the memory cells respond almost immediately. They begin to multiply right away and become plasma cells. This causes antibodies to be produced practically instantaneously. In these later infections, the response is so quick that symptoms can be prevented. This is known as the secondary immune response and is what gives people immunity to a disease.

Continued on next page:

Figure 1: Cells involved in the host defense



Session 4: Principles of Comprehensive Care for Children Living with HIV

Total Session Time: 1 hour 15 minutes

Learning Objectives

By the end of this session, participants will be able to:

- Describe the purpose of HIV and AIDS prevention, care, treatment and support program for exposed and infected children
- Explain the Paediatric HIV and AIDS comprehensive care package
- Describe the continuum of care in paediatric HIV and AIDS
- Explain the management of HIV and AIDS as a chronic disease
- Outline necessary health systems support for comprehensive HIV and AIDS care

Purpose of HIV and AIDS Prevention, Care, Treatment and Support Program & Paediatric HIV and AIDS comprehensive care package

Purpose of HIV and AIDS Prevention, Care, Treatment and Support Program

To improve quality of life of HIV exposed and infected children and that of their families by:

- Assuring equitable access to comprehensive services: All HIV infected and affected children should have equal opportunity to treatment and care services regardless of their social, economic or cultural differences.
- Reducing child HIV-associated morbidity and mortality: Antiretroviral drugs have revolutionized HIV and AIDS care. ARV drugs are not a cure for HIV but they have dramatically reduced morbidity and mortality, and improved the quality of life for adults and children.
- Ensuring HIV exposed and infected children achieve 'normal' growth and development. The concepts of growth and development using the definitions below:
    - Growth is gaining weight, length/height and head circumference
    - Development is acquisition of milestones and new skills (Motor, social, hearing and speech).

NOTE: The definitions of the terms "exposed and infected children":

- **HIV exposed:** infants and children born to mothers living with HIV until HIV infection in the infant or child is reliably excluded and the infant or child has stopped breastfeeding for at least 6 weeks.
- **HIV-infected:** A child confirmed to be HIV positive with PCR for children <18 months or with antibody test for children ≥18 months.

Paediatric HIV and AIDS Comprehensive Care Package

The components of Paediatric HIV and AIDS comprehensive care package include:

- Access to preventive services, including PMTCT, primary HIV prevention, PEP, immunization, OI prophylaxis.
- Early determination of exposure and infection status.

- Routine health services, including:
  - Growth and development monitoring and promotion, ITNs, de-worming, Vitamin A and mineral supplements, health education
  - Management of common childhood infections
  - Effective Antiretroviral Therapy (ART)
  - Palliative and home based care
  - Psychosocial support
  - Care and support to parents/care takers
  - Promotion of disclosure and stigma reduction
  - Linkages of other social support services
  - Ensure continuum of care to HIV infected children

*Refer to **Handout 1.4.1: A Framework for Comprehensive Care for Children Affected by HIV and AIDS** on **page 37**.*

*Refer to **Handout 1.4.2: Comprehensive Care Package for Children** on **page 39***

Continuum of Care in Paediatric HIV and AIDS, Management of HIV and AIDS as a Chronic Disease & Necessary Health Systems Support for Comprehensive HIV and AIDS care

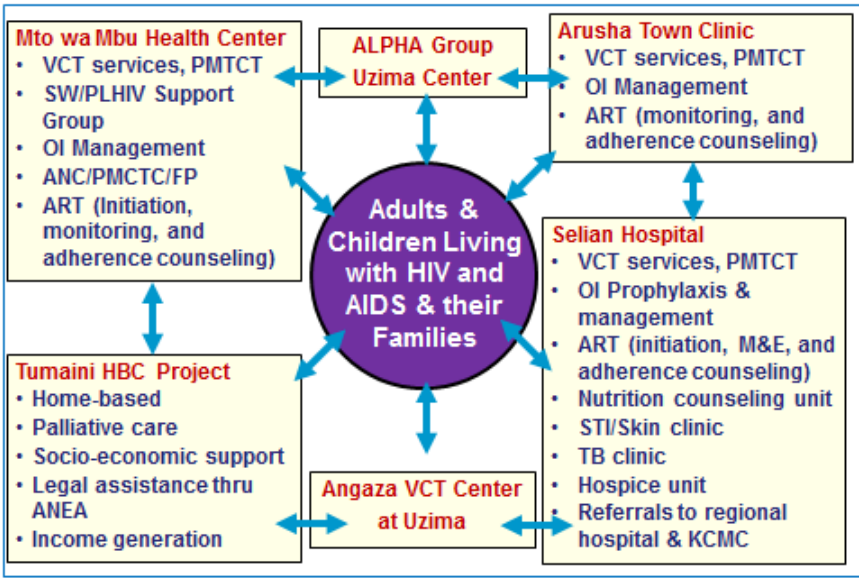
Continuum of Care

A care delivery approach that links health, medical and social support services within a confined geographic area.

To be successful, the continuum of care approach requires a good system of referrals and linkages among health, medical, and social services, such as:

- Referrals within and between health facilities such as RCH (PMTCT), OPD, IP, TB, other pediatric clinics (tertiary level), Malnutrition ward, VCT, home based care and to-and-from CTC.
- Referrals to community & social support programs

Example of Continuum of Care



In HIV care and treatment, all services cannot be provided in one facility, so integration and linkage of services is very important.

Activity: on the structural component of continuum of care in a plenary session.

*Refer to **Worksheet 1.4.1: Group Exercise** on **page 45** for more information about the activity*

Chronic Disease Management Approach
HIV and AIDS care requires a shift from a predominantly acute illness model to a **chronic disease management** approach following availability of ARVs; this is also true for children.

Planned, integrated, and well-documented care is the only way to effectively deliver preventive and antiretroviral therapies and support for a spectrum of changing needs, because the needs of patients keep on changing with time as the patients gets older.

Therefore, chronic disease management approach requires:
- Establishment and maintenance of easily retrievable quality records and reports
- Consistent trustworthy relationship between patient and health care team members
- Weekly interdisciplinary care team meetings to address patient issues, review treatment protocols, share concerns and support colleagues can prevent burn-out and attrition

Although an infectious process, HIV infection is managed on the principles of chronic care which are similar to the care of other chronic conditions such as diabetes. Thus, best outcomes are dependent on a team approach involving patient, family members, and health care team.

Ongoing care involves regularly scheduled clinic visits and supportive staff. It enables:
- Monitoring disease status and treatment effect
- Ready response to emerging health and social issues
- Trust-building and relationship-building between patients and care providers

Principles of Good Chronic Care
The principles of treating children with HIV and AIDS are often not very different from adult management—many of the concepts in HIV medicine are the same. These include:
- Understand that ARV therapy is life long
- Develop a treatment partnership with your patient (Child/caregiver) and family
- Focus on your patient's/caregiver concerns and priorities
- Use the 5 A's: Assess, Advise, Agree, Assist, Arrange
- Support patient self-management
- Link the patient to community-based resources and support
- Assure continuity of care - organize active follow-up
- Regular monitoring is key to early identification of problems
- Work as a team

NOTE: The 5 A’s approach using main points below:
- After patients receive necessary acute care, use the 5 A’s to introduce chronic care.

Assess:
- Goals for current visit
- Understanding, interest, readiness for prophylaxis and ART
- Family circumstances

Advise:
- Explain and recommend treatment or prophylaxis
- Encourage testing of family members
- Explain family care options

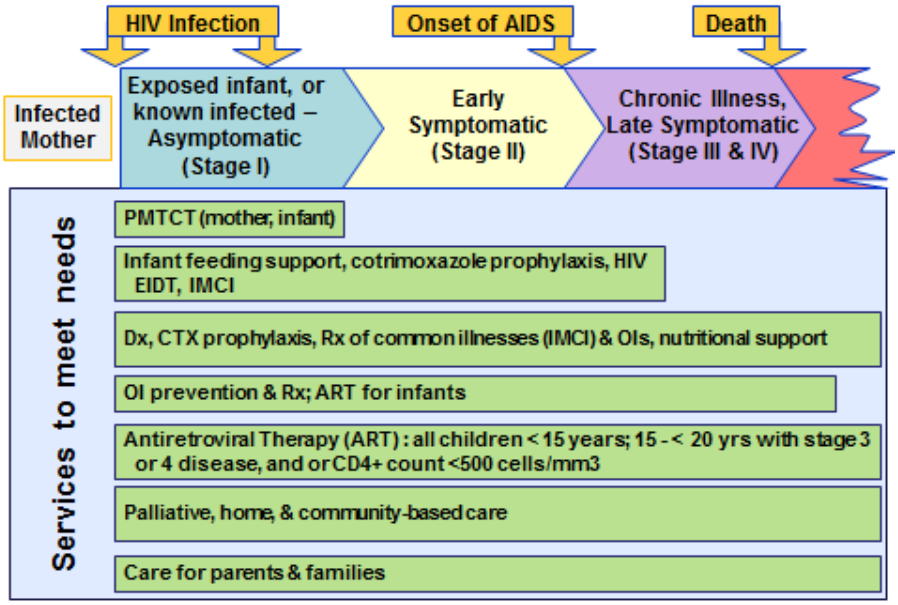
Agree:
- Agree on a treatment plan

Assist:
- Support adherence to treatment plan
- Plan home visit, if desired

Arrange:
- CTC 1 and CTC 2 forms
- Make follow-up appointment
- Arrange home visit as appropriate and feasible

*Refer to **Handout 1.4.3: General Principles of Good Chronic Care** on **page 41** for more information.*

Changing Needs of Children Affected by HIV and AIDS
This diagram shows the changing needs of children affected by HIV and AIDS



Basing on the above figure showing changing needs:
The needs of children living with HIV and AIDS increase as they progress through the stages of the virus. PLHIV needs for prevention, care, treatment and support vary by person and disease stage. Services should be coordinated in every stage to optimize patient care.

Health Systems Support For Comprehensive Care

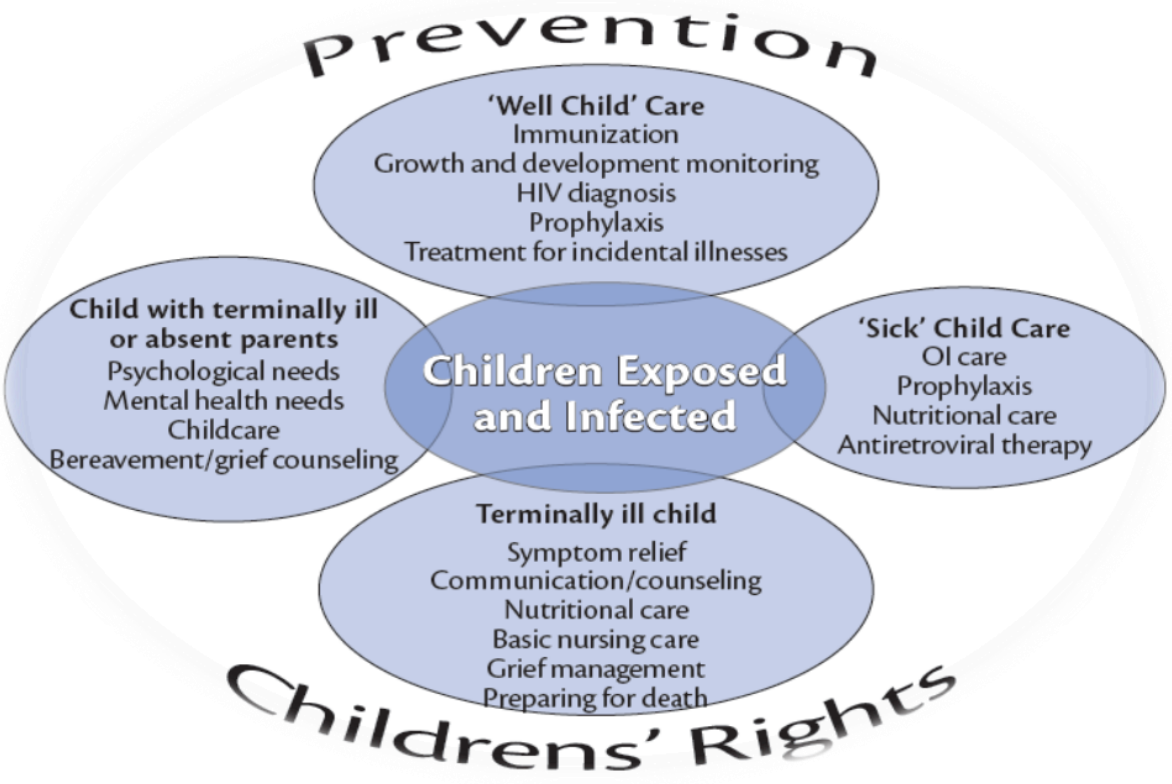
Essential support for HIV care comprises of:

- Human resources & HR capacity
- Health management information systems
- Logistics and supplies management systems
- Mentorship and supportive supervision framework
- Decentralization of services
- Referrals

Key Points

- HIV prevention, care, treatment and support requires:
  - Integrated and documented approach
  - Investment in health system
- The diverse & evolving nature of HIV, especially in a growing child with changing family needs, requires a team-based approach to care that places the child at the center
- The intensity of child/caregiver interaction requires additional support systems for both the family and health care providers

Handout 1.4.1: A Framework for Comprehensive Care for Children Affected by HIV and AIDS and their Families



Children infected and affected by HIV are in the centre, and the supportive mechanisms are surrounding and overlapping.

A care-delivery approach links various services within a confined geographic area. Addressing these services together increases their effectiveness as a whole.

These services include:

- Medical and nursing care
- Psychological support
- Socioeconomic support
- Spiritual support
- Involvement of HIV-positive individuals and their families
- Legal support and
- Strong referral system

Handout 1.4.2: Comprehensive Care Package for Children

1. **Confirm HIV status as early as possible:**
   - Allows for appropriate & timely care interventions to prevent/ reduce early morbidity and mortality.
   - Provide routine testing for all sick children in high HIV prevalence areas
   - Offer HIV testing to women who deliver with unknown HIV status
   - Where DNA PCR not available, treat presumptively if infant was exposed and symptomatic.
   - Urgent need to avail HIV DNA PCR tests for young infants exposed to HIV.

2. **Monitor the child's growth & development:**
   - Growth failure is greater in HIV-infected children than in uninfected children.
   - Growth monitoring helps identify the vulnerable child and monitors the effect of interventions.
   - Allows for early identification of growth faltering and institution of corrective measures to promote growth and development.

3. **Immunizations: Start and complete according to the recommended schedule:**
   - For BCG vaccination at a later age (vaccination for no scar or missed earlier vaccination), exclude symptomatic symptomatic HIV infection.
   - Avoid live vaccines when child is symptomatic for HIV/AIDS BUT
   - Give measles vaccine even when symptoms are present.

4. **Prophylaxis against opportunistic infections, particularly PCP (pneumocystis pneumonia). Cotrimoxazole Preventive Therapy is indicated for:**
   - All infants born to HIV-infected mothers irrespective of ARV use during pregnancy and labor. Continue prophylaxis till HIV infection is excluded.
   - All children < 5 year of age confirmed to be HIV infected regardless of symptoms or CD4%.
   - All HIV infected children >5 years of age who are symptomatic (WHO clinical stages 2, 3 or 4) or with a CD4 of < 500. Stop primary prophylaxis for adults and children ≥ 5 years once the patient has a CD4 ≥ 500.
   - Any child with history of PCP: continue with secondary prophylaxis for life.

5. **Treatment of acute infections and other HIV-related conditions:**
   - Actively look for and treat infections early.
   - More aggressive and longer treatment courses may be necessary.
   - Exclude/treat tuberculosis.

6. **Counsel the mother/caregiver and family on:**
   - Optimal infant feeding to:
     - minimize MTCT
     - prevent malnutrition
     - promote growth & development
   - Good personal and food hygiene to prevent common infections.
   - Follow up schedule (WHO recommendations).

7. **Conduct disease staging for the infected child (with or without laboratory support):**
   - Provides a guide to the prognosis.
   - Provides a guide to interventions needed at different stages.
   - Staging is a monitoring tool for disease progression/improvement.

8. **Offer ART for the infected child, if needed:**
   - Counselling for ART necessary.
   - Follow national guidelines.
   - ART works and is well tolerated by children.
   - ART promotes the survival of HIV-infected children.
   - Preserves, enhances, or reconstitutes the immune system and therefore reduces opportunistic infections.

9. **Provide psychosocial support to the infected child, mother/caregiver & family.**

10. **Refer the infected child for higher levels of specialized care if necessary, or for other social or community-based support programs.**

Handout 1.4.3: General Principles of Good Chronic Care

These principles can be used in managing many diseases and risk conditions.

1. Develop a treatment partnership with your patients.
2. Focus on your patient's concerns and priorities.
3. Use the 5 A's: Assess, Advise, Agree, Assist, and Arrange.
4. Support patient self-management.
5. Organize proactive follow-up.
6. Involve "expert patients," peer educators and support staff in your health facility.
7. Link the patient to community-based resources and support.
8. Use written information – registers, Treatment Plan, treatment cards and written information for patients – to document, monitor, and remind.
9. Work as a clinical team.
10. Assure continuity of care.

Principle 1: Develop a Treatment Partnership with Your Patient

- A partnership is an agreement between two or more people to work together in an agreed way toward an agreed goal.
- For good chronic care, the partnership is between the health worker/clinical team and the patient where both parts share responsibility for the agreement.
- Each partner knows what role he or she plays in the partnership. Partners treat each other with respect and one partner does not have all the power.

Principle2: Focus on Your Patient's Concerns and Priorities

- Often health care workers focus only on the obvious signs or symptoms of illness.
- It is important to find out why the patient has come and to address his/her concern.

Principle 3: Use the 5 A's - Assess, Advise, Agree, Assist, Arrange

- The 5 A's form a series of steps to use in patient care. More information on the 5 A's can be found in the General Principles of Good Chronic Care Module of IMAI.

- Assess:
  - Most health care workers know the process to assess a patient's condition and recommend treatment. In IMAI, this is called *Assess-Classify-Identify Treatments*.
  - In acute care, health care workers usually assume that the patient's goal for the visit is treatment for their main symptoms.
  - They may fail to assess behavioural risk factors or how the patient is managing their chronic condition and miss the real reason for the patient's visit.
  - For good chronic care, all reasons for the visit must be assessed and addressed.

- Advise
  - This includes recommending treatments to the patient, educating the patient, and preparing the patient for self-management.
  - Discuss the options. Don't just tell the patient what to do.

- Agree
  - The patient understands, wants and accepts the treatment plan. Health workers often skip this step. Ask checking questions to evaluate patient's readiness to adopt the treatment.
  - It may be logical to skip this step during emergency trauma care or when a patient is too sick to discuss or make a choice.
  - 'Agree' is a key step in forming a partnership with the patient and supporting good patient self-management.

- Assist
  - Advice, counselling, treatment and support to help equip the patient with skills to carry out the treatments or to overcome barriers.
  - Getting others to help, by linking to available community or peer support or involving treatment supporters.
  - Usually health workers and the patients focus only on the tablets or the injections. But for life-long treatment like ARV therapy, much more support is needed.
  - Problems in treatment plans can arise if health workers skip 'Assist'. When the patient returns, they may need more assistance to solve problems and overcome obstacles.

- Arrange
  - Definite follow-up, scheduling a group appointment, arranging how the medication can be picked up on the next visit, and recording what happened on the visit.

Principle 4: Support Patient Self-Management

- Self-management means that the patient takes responsibility for the daily treatment of her/his condition.
- Patients with chronic conditions such as HIV have a vital role in managing their own:
  - Proper diet
  - Exercise
  - Practicing safer sex (using condoms) and preventing STIs and undesired pregnancies
- The care team helps patients understand their options and the consequences of their decisions.
- Always leave the patient in charge of his/her own care as much as possible.

Principle 5: Organize Proactive Follow-Up

- Plan to follow-up with patients after the first visit.
- Scheduling for the next visit and the plan of management for the visit are very important.

Principle 6: Involve 'Expert Patients', Peer Educators & Support Staff in your Health Facility

- Involving expert patients, peer educators and other support staff in the clinic has a very big impact when compared to using health workers alone.
- New patients may learn a lot from the experiences of others.

Principle 7: Link the Patient to Community-Based Resources and Support

- Linking the patient to community groups/post-test clubs has many benefits:
- Patients may gain knowledge on adherence to medications.
- Reduced stigma and discrimination that can encourage disclosure.
- Income generating activities or funds to help individuals and the group as a whole.
- Home-based care activities to help trace other patients who are lost to follow-up.
- When willing, link the patient to any community-based group for support.

Principle 8: Use Written Information to Document, Monitor and Remind

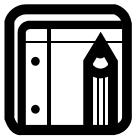
- Patient information should be kept well-organized for monitoring and follow up.
- There are several tools that are used for this purpose, such as:
  - CTC-1 card: Given on the first visit and kept by the patient.
  - CTC-2 card: Opened on the first visit and kept in patient's file at the facility.
  - Pre-ART register: Tracks progress of patients enrolled in HIV careas they become eligible for ART;
    - Includes all patients who have started ART on their own or in another programme outside the CTC (but with no records).
    - Patients on ART who are transferred into the facility with records should not be entered in the Pre-ART register.
    - Once the patient begins ART, she/he is transferred to the ART register and is no longer tracked through the pre-ART register.
  - ART register: a tool for monitoring patients who have actually started ART.
    - Used only after a patient has started ART. No further entries should be made in the pre-ART register.
  - Report forms**:**
    - Cross-sectional reports: Filled monthly and quarterly.
    - Cohort analysis report form: Filled in from the pre-ART and ART registers.

Principle 9: Work as a Clinical Team

- To provide good chronic care, health care workers should work as a clinical team to deliver both acute and chronic HIV care, including ART.
- To deliver ART, a clinical team should include a clinician, nurse, counsellor and all other related staff.
- The team may work together or differently depending on where they are located.
- Each team member must have clear job description to fulfil his/her responsibilities.

Principle 10: Assure Continuity of Care

- Continuity of care should be assured to patients who will need lifelong treatment.
- Drug supply (particularly ARVs and drugs for OIs) should be reliable.
- Laboratory services and linkage with the community support groups should also be assured and continuous.



Worksheet 1.4.1: Group Exercise

This group exercise will help you to assess the structural component of continuum of care in a plenary session.

Instructions: Work in small groups and spend 15 minutes to complete an inventory of:

- Prevention, Care, Treatment and Support organizations concerning pregnant women
- HIV exposed or infected children relevant for the catchments-area where they are working.

An additional 15 minutes should be spent on group discussion during which the facilitator should call on different participants to present one particular structural component of continuum of care in a plenary session.