

**HIV-1 SEROPREVALENCE AMONG PAEDIATRIC  
ADMISSIONS AT THE UNIVERSITY TEACHING  
HOSPITAL (UTH) - LUSAKA**

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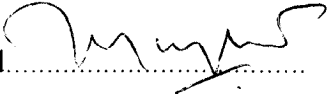
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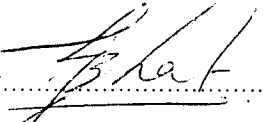
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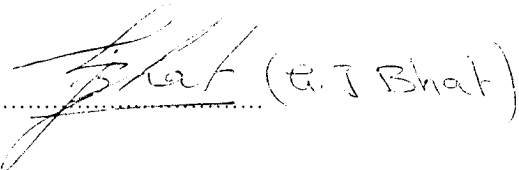
## DECLARATION

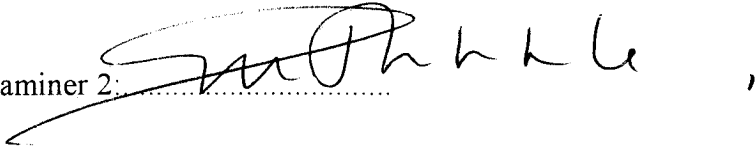
I hereby declare that, this dissertation is entirely the result of my own work. It has not been previously submitted for a degree at this, or another university.

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This dissertation for Dr. Sitali Maswenyeho is approved as fulfilling the partial requirements for the award of a Masters Degree in Paediatrics, by the University of Zambia, Lusaka.

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## *ABBREVIATIONS*

AIDS	-	Acquired Immunodeficiency Syndrome
ADD	-	Acute Diarrhoeal Disease
BCG	-	Bacille Calmete - Guerin
CNS	-	Central Nervous System
CDD	-	Chronic Diarrhoeal Disease
CMV	-	Cytomegalovirus
DDI	-	Didanosine
EBV	-	Epstein barr virus
ELISA	-	Enzyme Linked Immunosorbent Assay
FTT	-	Failure to thrive
G/E	-	Gastroenteritis
HIV	-	Human Immunodeficiency Virus
HIVIG	-	Human immunodeficiency virus immunoglobulin
HPV	-	Human papilloma virus
IMR	-	Infant Mortality Rate
KOH	-	Potassium Hydroxide
LIA	-	Line immuno assays
LIP	-	Lymphoid Interstitial Pneumonia
MTCT	-	Maternal to child transmission
PCR	-	Polymerase Chain Reaction
PEM	-	Protein Energy Malnutrition

PPD	-	Purified Protein derivative
RSV	-	Respiratory Syncytial virus
RTI	-	Respiratory Tract Infection
SCD	-	Sickle Cell Disease
TB	-	Tuberculosis
U5MR	-	Under Five Mortality Rate
UTH	-	University Teaching Hospital
UTI	-	Urinary Tract Infection
UNICEF	-	United Nations International Children's Fund
WHO	-	World Health Organization
ZDV	-	Zidovudine

## ABSTRACT

The seroprevalence of human immunodeficiency virus type 1(HIV-1) among paediatric admissions were studied at the University Teaching Hospital (UTH) Lusaka, Zambia during the period from 22<sup>nd</sup> November to 15<sup>th</sup> December, 1995. This was at a time when the number of admissions to the department of Paediatrics and Child Health were highest. The admission rate on average at this time of the year is 2,000 children per month. This busy period usually starts from the month of October to February each year. The study was a cross sectional survey, evaluating disease presentation among HIV-1 positive and HIV-1 negative children admitted to the department. The children were enrolled to the study using a systematic sampling method around the clock at the outpatient department. A standardized questionnaire was administered to every fifth child admitted. A consent was sought from the accompanying adult to recruit the child and test the child for HIV. Blood for laboratory tests including HIV test was collected.

During the period of the study 2011 children were admitted to hospital out of which three hundred and three (303) joined the study. The overall HIV-1 seroprevalence for the study group was 30.4 percent while that for the children aged 18 months and more was 27.8 percent. There was no sex difference in the HIV-1 seroprevalence. Educational levels of the mothers was used as a proxy to determine socio-economic status of the children. The mothers who had secondary school education and higher were categorized as belonging to a group of high socio-economic class while those who had no formal education or primary school education belonged to the low socio-economic class. There was a high HIV-1 seroprevalence in children whose mothers had secondary school education or higher as compared to children born to mothers with primary school education or none. This means HIV seropositivity was more common in children from high socio-economic class than from those of low socio-economic class. The illnesses that were seen in the study period were Respiratory tract infection, Protein energy malnutrition, Malaria, Gastro-enteritis, Measles and Anaemia. RTI and Anaemia were seen more in the children who were HIV-1 seropositive than in the HIV-1 seronegative group.

The mortality rate in the HIV-1 seropositive children was 15.6 percent as compared to 9.3 percent in the HIV-1 seronegative children. The illnesses that were associated with death in both HIV seropositive and HIV seronegative children were RTI, PEM, G/E, Malaria and Measles. The main cause of death in children who were HIV-1 seropositive was RTI while PEM caused more death for those who were HIV-1 seronegative. Postmortems were not carried out to confirm the causes of death in these children.

## CHAPTER ONE

### 1.0 INTRODUCTION

Human Immunodeficiency Virus (HIV) and the acquired immunodeficiency syndrome (AIDS) is causing a significant impact on child survival programmes both in developed and developing countries. In the state of the world's children 1995; UNICEF has described HIV/AIDS as a children's tragedy(1). As of mid 1995 the World Health Organization (WHO) estimated that around 18.5 million adults and more than 1.5 million children, were infected with HIV globally. HIV infection invariably leads to AIDS and subsequent premature death. It was estimated that over 4.5 million adults and children have already contracted HIV/AIDS and many had died by 1995. This number is steadily increasing and it is estimated that by the year 2000, there will be more than 20 million infections of which more than 9 million will be in Africa and 8 million in Asia(2).

Sub-Saharan Africa has the largest number of HIV infected individuals with a significant concentration in the region of East and Southern Africa. The rising infection rate in women is accompanied by a corresponding rise in the number of children born with HIV infection. According to one estimate, in 1990, seventy five percent of the estimated 3.5 million HIV infected women were in Sub-Saharan Africa. These women gave birth to over eighty five percent of the world's perinatally infected infants, AIDS cases and AIDS orphans(2).

In many of the most affected countries, infant and under 5 mortality rates (IMR and U5MR) are on an increase and life expectancy has started declining(2). The infection can be transmitted across the placenta early in gestation and this is supported by the identification of the virus in fetuses at 15 weeks of gestation (3). The consequences of vaginal delivery and breast feeding are sources of concern since the virus can sometimes be isolated from cervical

secretions and milk from seropositive mothers. HIV infection is generally considered to be more severe in infants than in adults, partly because of the immaturity of the immune system in the infant(3).

In Zambia ,the first AIDS cases were diagnosed in 1984. The cumulative total number of notified AIDS cases had increased to 29,734 by October, 1993(4). The data available on HIV-1 infection indicate that Zambia is among the countries affected seriously by the HIV/AIDS epidemic. The HIV-1 seroprevalence rate in pregnant Zambian women is estimated in sentinel surveys at 34 percent in urban areas and 13 percent in rural areas. A significant proportion of these women transmit HIV to their children by perinatal transmission(4). An ever increasing seroprevalence rate of HIV-1 in children in Zambia has been reported for example in children with tuberculosis, the HIV-1 seroprevalence rates have increased from 24 percent in 1989 and 37 percent in 1990 to 56 percent in 1991(5,6). It seems therefore that HIV-1 infection in children will reverse the successes that have been achieved in the control and treatment of childhood infectious diseases. Recurrent bacterial infections are more common in HIV infected children than opportunistic infections, especially in developing countries where they are a major cause of morbidity(7). The frequent bacterial infections are a result of B-cell dysfunction with abnormal immune responses to protein and polysaccharide antigens leaving the children susceptible to common bacterial pathogens such as *streptococcus pneumoniae* or *Hemophilus influenzae type B*. Localized infection such as impetigo, otitis media, pneumonia and sinusitis are common. Recurrent serious bacterial infections defined as two or more episodes of bacteriemia, meningitis, osteomyelitis, deep seated abscesses or septic arthritis in a year are AIDS defining criteria in children aged under 13 years(8). Viral infections may be recurrent or chronic. A few children have had chronic varicella lesions or recurrent herpes zoster.

Hepatosplenomegaly, diffuse lymphadenopathy, parotitis, and skin diseases are associated with HIV-1 infection but these have good prognosis (8). Other disease presentations are

progressive neurological disease, fever, anaemia and diarrhoea with negative prognostic factors for survival. Growth failure, hepatitis, cardiomyopathy and persistent oral candidiasis also depict a shorter survival span(9). Despite the gloomy picture that was initially painted in children with HIV-1 infection, it is becoming clear that seventy percent of children are alive at 6 years in the United states of America(9). With such survival rates it has become important that children infected with HIV are identified and managed appropriately so as to increase their chances of longer survival. This can be achieved by recognizing clinical problems faced by HIV infected children and drawing appropriate guidelines for their management. AIDS is among the leading causes of death in children aged 1 to 4 years. Children infected with HIV-1 often get hospitalized two or three times each year(10). In view of these frequent admissions paediatric services need to be streamlined and be ready to diagnose HIV infection at the earliest possible time if the survival rates of up to more than 6 years are to be achieved. HIV infection in children presents a challenge to all care takers of children. The natural history of HIV disease continue to evolve and our challenge for the future will be the prevention of perinatal transmission, the development of new laboratory techniques for early diagnosis and improved therapies(10,11). The two main types of studies that are commonly used to evaluate the epidemiology of HIV-1 infection in children include clinical follow up studies and surveys of seroprevalence(11). The present study is a cross sectional survey and seeks to estimate the prevalence of HIV-1 infection among paediatric admissions at UTH in order to generate data on the trend of HIV-1 infection in children, evaluate the disease presentation and the socio-economic back ground of the affected children. The back ground data is compared with HIV-1 negative children who are the control group.

## CHAPTER TWO

### *REVIEW OF LITERATURE*

#### **2.1 EPIDEMIOLOGY**

Human immunodeficiency virus (HIV), the causative agent of acquired immunodeficiency syndrome (AIDS) was, first identified in 1983(2). AIDS has spread all over the world and has become a "Pandemic". By mid 1994, more than 17 million HIV infections were estimated to have occurred since the beginning of the pandemic, over 16 million of them in adults(2). The HIV epidemic has had the greatest impact on women and children in certain parts of Africa and the Caribbean, where heterosexual contact is the primary mode of HIV transmission.

World wide, there are three men for every two women infected whereas in Sub-Saharan Africa, more women are infected than men(2). The rising infection rates in women are accompanied by a corresponding rise in the number of children born with HIV infection. As of mid 1994 there were 330 805 cumulative adult and paediatric AIDS cases who had been reported to WHO from Sub-Saharan Africa. This figure does not reflect the actual infection levels due to under reporting. Projections of the number of AIDS cases in infants and children are based on perinatal transmission rates of about thirty percent.

Paediatric HIV/AIDS is a growing problem . It is estimated that by the turn of the century 4 - 8 million children world wide will be infected by HIV-1(8). The spread of HIV-1 can be portrayed as a single epidemic in different population(e.g adult men, women and children). The dynamics of the epidemic vary from continent to continent, country to country and within different areas of a given country(4). Data available on Zambia, one of the sub saharan African countries indicate that the HIV/AIDS epidemic is on the increase(4).

Projections are that in Zambia IMR will be 129 and U5MR will be 269 by the year 2005, which is almost 50 percent higher than the estimate for 1990(4). In Africa the major route of HIV transmission is by heterosexual intercourse, which accounts for about 80 percent of all infections. The second most important route of transmission is perinatal(mother to child). Other routes of transmission like contaminated blood and blood products are of relatively minor importance(4). Perinatal transmission of HIV infection is a consequence of HIV infection in child bearing women. A sentinel survey carried out in Zambia in 1992 on women attending antenatal clinics showed HIV-1 seroprevalence of 34 percent in urban areas and 13 percent in rural areas(4).

### **2.1.1 Mother to child transmission( MTCT) of HIV**

Regarding perinatal or vertical transmission of HIV infection the following facts highlight the magnitude of the problem of HIV in women and children.

- (1) There are over five million HIV infected women, mostly of child bearing age.
- (2) Of these eighty percent are in Africa, but figures for Asia and Latin America are increasing rapidly.
- (3) More than one million HIV infected children were born by 1993.
- (4) In Africa an estimated 500,000 children are born to HIV-1 infected mothers per year.
- (5) HIV post natal transmission will occur by way of breast feeding, blood and blood product transfusion, exposure to contaminated needles and surgical instruments and from sexual abuse by person infected with HIV (11).

Whilst dealing with the principal issues in epidemiology of maternal to child transmission (MTCT) of HIV the following are highlighted; rate and timing of transmission (intrauterine, intrapartum, postpartum), risk factors for transmission and possible interventions to prevent MTCT). Vertical transmission of HIV can occur before (intrauterine), during (intrapartum), or after delivery(through breast feeding). Intrauterine and intrapartum transmission are most common, but the proportions of children infected during these two periods has not been firmly established(12,13). Intrauterine transmission has been suggested by identification of HIV by

culture or PCR in fetal tissue as early as 10 weeks gestation(13). In addition, first trimester placental tissue from HIV infected women has been demonstrated to contain HIV by in situ hybridization and immunocytochemistry.

Data suggest that a good number of children with HIV infection acquire the virus intrapartum analogous to hepatitis B transmission(14). First, HIV has been isolated from cervical and vaginal secretion, second, the international registry of HIV exposed twins found that among discordant twins, the first born twin was three times more likely to be infected(14). The other mode of vertical transmission is by breastfeeding. Both free and cell associated virus have been detected in breast milk from HIV infected mothers. A meta analysis of prospective studies found that the additional risk of transmission through breast feeding in women with HIV infection before pregnancy was 14 percent(14,15). Risk factors influencing the rate of vertical transmission include maternal p24 antigenemia and depressed CD4+ count, placenta membrane inflammation, delivery before 34 weeks gestation and advanced maternal disease stage or AIDS(15).

## **2.2 CLINICAL FEATURES AND COURSE OF THE ILLNESS**

The first clinical descriptions of children with acquired immunodeficiency virus appeared in 1983. Fifteen children were simultaneously reported from the Bronx, NY and Newark, NJ. In 1984, 14 infants, 12 of whom were born to Haitian mothers were reported from Miami(13). The signs and symptoms of HIV-1 infection are many and may involve multiple organ systems. These manifestations can be the result of the direct action of HIV-1 or secondary to the immunodeficiency complicated by opportunistic infections and neoplasms. Typically, the diagnosis of HIV-1 infection in infants born to HIV-1 infected mothers is first suspected by the appearance of certain clinical findings.

The diagnosis of AIDS in infants and children requires a high index of suspicion and may be particularly difficult in isolated and sporadic cases. A history regarding possible risk factors for

HIV-1 infection in both the parents and the child is warranted. Although there is a subset of children who will not develop symptoms until later in life, the majority of infants present with clinical symptoms within the first year of life. Early symptoms of HIV-1 infection may be non specific, but their persistence and severity should raise suspicion (16,17). Persistent oral candidiasis with failure to thrive is a common early presentation. Generalized lymphadenopathy and hepatomegaly with or without splenomegaly are also common findings.

Lymphadenopathy is usually present in two or more noncontiguous sites with nodes larger than 1cm. In one prospective study any of these physical findings was present by the first birthday in seventy-three percent of those infants found to be infected(16). Parotitis, as a consequence of lymphocytic infiltration of the parotids, is present in ten percent to forty three percent of children with HIV-1 infection (17,18). In some patients these nonspecific findings resolve spontaneously. The clinical sequelae of HIV infection is that sixty percent of children born to HIV-1 positive mothers escape infection and thrive well(19). Five to fifteen percent develop AIDS in the first months of life and may die soon thereafter. Ten to fifteen percent remain relatively well during their infancy but gradually become chronically ill during childhood(19,20). A small number of infants with HIV-1 survive frequent bacterial infections as an infant then become healthier, living for over 6 years. However, globally about four in ten infants with HIV-1 do not live more than 12 months and over half will die by their second birth day(8).

### **2.2.1 Complications**

Infections (pathogenic and opportunistic) are the main cause of morbidity and mortality in HIV-1 infected children. They should be anticipated and prophylactic measures instituted in a timely fashion. Their diagnosis should be sought aggressively since the large majority are treatable with readily available agents. The most common infections seen in HIV-1 infected children are those caused by bacteria, viruses and fungi.

## **Bacterial**

HIV-1 infected children are at great risk of contracting various types of bacterial infections. This may be due to cellular immunodeficiency (*Listeria monocytogens*, *salmonella species*), neutrophil defects and frequent use of indwelling devices (*staphylococcus species*, *pseudomonas species*) as well as to subnormal humoral responses to capsular polysaccharide antigens like that of *streptococcus pneumoniae*. A subset of HIV infected children show a pattern of recurrent serious bacterial infections (defined as two or more in a two year period) and this is considered a criterion for the diagnosis of AIDS (21,22). Most of these infections are caused by common organisms, particularly *streptococcus pneumoniae*. In children with central venous catheters, *staphylococcus aureus* is the most common bacterial pathogen(23).

Other serious infections that occur more frequently in HIV-1 infected children, compared to the immunocompetent population, include pneumonia, bacteremia, sinusitis, meningitis, urinary tract infection and soft tissue infection (24,25).

Staphylococcal cellulitis and abscesses are common and may be deep seated(23,26). Mycobacterial disease is increasingly important in HIV infected children(27,28). In Zambia a recent study carried out at the University Teaching Hospital, Lusaka, found that more than fifty percent of children diagnosed with pulmonary tuberculosis were seropositive for HIV-1(6). The common mycobacterium encountered in Zambia is mycobacterium tuberculosis(6). Active tuberculosis may precede HIV-1 related symptoms since mycobacterium tuberculosis is more pathogenic than other opportunistic pathogens(28). Progressive primary infections are more common than reactivation infection in children, as opposed to adults(28). The increase of tuberculosis cases in children is probably secondary to the increase in incidence of the disease in adults, due to the fact that children are more likely to become infected with tuberculosis from adults than from other children(29).

## **Viral**

Most viral pathogens reported in HIV-1 infected children belong to the herpes virus family. Cytomegalovirus (CMV) infection occurs commonly in HIV. Infection in these children can adversely affect their prognosis(30). The most important clinical manifestations are hepatitis, pneumonitis esophagitis, encephalopathy, retinitis and colitis but dissemination with multi-organ involvement can occur. Herpes simplex virus (HSV) usually manifests as recurrent episodes of gingivostomatitis or perineal ulcerations. These infections can become chronic and at times disfiguring. Recurrent zoster in a dermatomal distribution (varicella-zoster virus ) may be seen in some children. This may happen shortly (weeks, months), after varicella(31). The clinical spectrum of Epstein Barr Virus (EBV) infection in HIV-1 infected children is not well defined but is suspected to play a role in the pathogenesis of lymphoid interstitial pneumonitis (LIP) and certain lymphomas. EBV is also implicated in hairy leukoplakia, an oral lesion quite prevalent in HIV infected adults but uncommon in children(32).

Increased morbidity and mortality from common respiratory viruses have been reported in these children. Respiratory syncytial virus (RSV) infection in HIV-1 infected children is associated with pneumonia, relative absence of wheezing and prolonged viral carriage. Adenovirus and para influenza 3 virus can also have a more virulent course in these children(33). Measles may be fatal in HIV infected children. Prevention of measles is therefore important and immunization even in symptomatic HIV-1 infected children is recommended(34). Infections with human papilloma virus (HPV) can occur in HIV-1 infected children (34) condyloma acuminatum lesions are usually located on the perineum and genitalia. These lesions can be extensive, respond poorly to topical podophyllum resin treatment and recur after surgical resection. Flat warts due to HPV type 5 with extensive skin involvement have been reported in immunosuppressed children. These lesions have a tinea versicolor like appearance and have also been noted in other immuno-compromised populations.

## ***Fungal***

Mucosal infections with candida species are seen at some time in most children with HIV-1 infection. Oral candidiasis can present as pseudomembranous creamy plaques or as erythema on the hard palate or dorsum of the tongue (atrophic). It can also present with cheilitis. These plaques are easy to remove leaving an erythematous base. Extensive recurrent candida infection is one of the major clinical presentations seen in the diagnosis of AIDS in children in Zambia(35). Candida oesophagitis may be seen with or without concurrent oral involvement. Clinical symptoms of esophagitis include fever, poor appetite, weight loss and vomiting(36).

### **2.2.2 HIV AND ORGAN SYSTEMS**

#### ***Central Nervous System.***

Central Nervous System (CNS) abnormalities are common and have been reported in children with HIV-1 infection (37). In children, the most important problem is the development of an encephalopathy, and this may be the presenting feature(37). HIV-1 nucleotide sequence have been demonstrated in the brains of both adults and children with encephalopathy and HIV-1 has been cultured from the cerebral spinal fluid. Cytokine, a tumor necrosis factor, may mediate myelin damage (38). Preliminary data suggest that autoreactive antibodies against brain tissue components may play a role in its pathogenesis(39), since HIV-1 infection in children occurs during the development of the CNS, the associated encephalopathy has some features that are distinct from that occurring in adults.

In young children it is characterized by mental and motor delays, loss of developmental milestones and the development of pyramidal tract signs(40). Acquired microcephaly, ataxia, seizures and other movement disorders are also seen. Therefore HIV-1 infected children should be monitored routinely for neurodevelopmental deficit and referred for early intervention. The clinical course of CNS manifestations is variable, with some cases displaying a stepwise deterioration while others have a more progressive course. Progressive encephalopathy as a presenting illness carries a poor prognosis, with a median survival of less

than one year (41,42). Lymphomas of the CNS are found in up to 6 percent of adult patients but only a few cases children have been reported in paediatric AIDS patients(44).

### Respiratory system.

Lymphoid interstitial pneumonitis (LIP) is one of the most common pneumonias in HIV-1 infected children(45) and is a criterion for diagnosis of Paediatric AIDS. Its onset is usually insidious and may not be clinically evident in the early phases (45). Cough and dyspnoea are the most common symptoms. Auscultation of the chest usually reveals normal finding but wheezing and a prolonged expiratory phase may be present in some patients. The typical radiographic picture consists of symmetric bilateral reticulonodular interstitial infiltrates and hilar adenopathy. As the disease progresses the nodules enlarge and may even coalesce(45).

In many patients LIP resolves spontaneously. When LIP is the first manifestation of HIV-1 disease, it is associated with a good prognosis (46). HIV infected infants and children are at high risk of developing TB. It is one of the commonest respiratory opportunistic infections seen in Paediatric AIDS in developing countries(47). In Zambia, co-infection with TB and HIV is now one of the major public health problems. In one study done at UTH up to 50 percent of the children with pulmonary tuberculosis were HIV seropositive(6). Pneumocystis carinii pneumonia is also a frequent infection in HIV-1 infected children(8).

Recurrent pyogenic pneumonias have been seen to be one of the first clues of HIV infection. Empyema thoracis and chronic obstructive airway diseases like bronchiectasis will result from these pneumonias due to poor immunity. The most important pathogens are *H.influenzae* and *S.pneumoniae*. This will lead to development of respiratory failure in such children with prognosis being grave. For example only five of the thirty one children cared for in an intensive care unit in Miami survived their intensive care unit stay and three of the five survivors died within 6 months of their discharge. The causes of their respiratory failure included PCP thirteen, cytomegalovirus six, bacteremia nine, candida two and measles one (8,26,47).

## **Gastrointestinal system.**

The Gastrointestinal tract is commonly involved in AIDS children with frequent negative impact on their nutrition status. HIV infection has been shown to be associated with abnormal small bowel mucosa. Histologic findings range from normal mucosa to villous atrophy with associated crypt hyperplasia(13). This may represent local HIV infection or an unidentified opportunistic infection. Primary lymphoma, Kaposi's sarcoma of the gastrointestinal tract occur in adults but are rare in children(13). Opportunistic infections include *cryptosporidium*, *microsporidium*, *Isospora* and *G.lambliia*(13). Malabsorption leading to malnutrition is common in children with AIDS, regardless of the initial intestinal insult. A study done in rural Zambia revealed that some children with protein energy malnutrition were infected with HIV. This lead to high morbidity and mortality(48). Transient or persistent hepatomegaly or moderate elevation of the activity of liver associated enzymes is another common finding(49).

## **Cardiovascular system.**

The heterogeneity of findings on non invasive study and at autopsy suggest that multiple factors may be involved in the evolution of cardiovascular disease in HIV-1 infected children(50). Factors that play a role include myocardial infection and host response, malnutrition, drug related cardiotoxicity, vasculitis, autonomic neuropathy and debilitation.

Potential viral pathogens range from cardiotropic viruses to viruses presenting atypically in the setting of immunodeficiency. Group B coxsackieviruses and influenza A viruses are the

most causes of acute myocarditis in HIV-1 infected children(50). Myocarditis, dilated cardiomyopathy with congestive heart failure ,pericardial tamponade and sudden death have been observed in children with HIV infection(50). Overt signs of cardiac dysfunction usually occur later in the disease. Some pre-existing clinical conditions like hepatosplenomegaly, fever, pulmonary infections and anaemia, commonly present in these children and may mask the presence of cardiac dysfunction. The HIV-1 genome has been demonstrated by in situ hybridization within the myocardium in adults and children, suggesting a direct role of HIV-1.

### **Genito- urinary system**

There are four predominant patterns of HIV-1 associated renal manifestations; nephrotic syndrome, acute nephritic syndrome acute renal failure and renal tubular dysfunction(13). Nephrotic syndrome is the commonest and is characterized by proteinuria oedema, hypercholesterolemia and hypocalcaemia.

Clinically evident renal involvement is a late finding. In a large study the median age of onset of renal failure was thirty-nine months. Renal disease shows several types of lesions, including focal glomerulosclerosis, mesangial hyperplasia, focal necrotizing glomerulonephritis, minimal change disease and renal tubular acidosis type 'i'and 'ii'(13). Common autopsy findings include tubular necrosis, interstitial nephritis, mesangial hyperplasia and glomerulosclerosis.

## **Tumors**

Studies that have been carried out in Zambia have revealed that Kaposi sarcoma is increasingly becoming common in children unlike in the past. The average ages of those affected range from seven months to fourteen years with a peak at 5.62 years (51). In one autopsy series of children with AIDS, histopathologic evidence of Kaposi sarcoma, notably in the lymph nodes, liver, spleen, thymus, mesentery, the gastrointestinal tract and heart was found in 47 percent(51). Other malignancies that have been reported in children with HIV-1 include lymphomas(13).

## **2.3 DIAGNOSIS**

### ***2.3.1 Laboratory diagnosis***

The objective of the laboratory evaluation of an infant or child with possible HIV/AIDS is to establish his/her HIV status and if seropositive to determine the degree of immunodeficiency. CD4 lymphocyte measurement as the primary routine test for monitoring immune status and risk of disease progression in HIV infected children has been accepted as the most appropriate surrogate marker to follow immune status. The application of CD4 counts to predict immunosuppression and progression of HIV disease in children has been limited by the lack of normative data for CD4 lymphocyte counts based on age. CD4 lymphocyte counts below 500 cells/microlitre in children are generally associated with the development of opportunistic infections and encephalopathy(52). The initial HIV screening tests, adopted for routine use in 1985, were enzyme linked immunosorbent assays (ELISA). Although these tests detected HIV antibodies in patients with AIDS very effectively, their use in detecting antibodies in a non diseased individual has presented a different challenge (52). The occurrence of even a small number of false results by these tests can have profound implications when testing a population at low risk for infection (52).

Shortly after the HIV ELISA were marketed, other techniques for detecting HIV antibodies became available. Latex, red cell, and gelatin particle agglutination tests were introduced in an attempt to offer alternatives for ease of performance and for cost savings. Subsequently, the sample to perform dot-blot and combination assays were marketed. Many of these tests incorporated recombinant or synthetic peptide based antigens in an effort to address the suboptimal sensitivity and specificity of viral lysate based tests (53,54).

There are currently more than 130 tests from more than 40 commercial companies available for testing antibodies to the Human retro-viruses. Since the mid 1980s when HIV ELISA and Western blots became available for routine use, technology has evolved to include novel assays based on a variety of immunologic principles and assays whose performances address some of the persistent problems associated with the laboratory diagnosis of retro-viral infections. Assays now have improved sensitivity and specificity, which can help differentiate between true and false retroviral infections in newborns. Newer technologies include combination assays, third generation antigen sandwich techniques, line immuno assays (LIA), Augmented western blots, Particle adherence tests, substrate amplification methods, the use of recombinant and synthetic peptide antigens, tests that detect different isotypes of antibody and tests that have built in quality controls (55).

### ***Antibodies to HIV (IgG)***

This is a useful marker for adults and children older than 18 months born to HIV infected mothers and children suspected to have acquired the infection from non-perinatal routes, eg blood or blood products. Serologic testing for HIV specific antibody is the mainstay of laboratory diagnosis of HIV infection. The tests are based on the capture of total IgG by incorporating an anti IgG antibody attached to the solid phase. Therefore, all antibodies of the IgG isotype, including specific antiviral IgG are bound (52). The most currently used antibody tests are the enzyme-linked immunosorbent assay (ELISA) used in conjunction with supplemental tests for example western blot, fluorescent assays (IFA) to confirm ELISA

reactions. It has to be noted that ELISA is a screening test with high sensitivity and specific (>99.8%) each, but its predictive value in persons at low risk is low.

### ***Specific Anti HIV-1 1gA and 1gM Assays***

Maternal IgA and IgM do not cross the placenta, therefore their presence in infant/child sera indicates presence of HIV in infants/children. This is a very useful test from six months up wards but unreliable in children aged three to six month.

### ***P24 Antigen***

The p24 antigen assay has been a helpful but limited method of diagnosing paediatric HIV infection, mainly because it requires a sophisticated laboratory set up(55).

### ***HIV Virus Culture***

This is one of the most sensitive techniques used extensively in research settings. Its accuracy needs no mention but it is expensive and needs sophisticated equipment and highly trained personnel(55).

### ***Polymerase Chain Reaction (PCR)***

PCR is one of the most sensitive techniques for detecting HIV infection. HIV is an RNA virus which transcribes its RNA into DNA using the viral enzyme reverse transcriptase after entry into the cell, there by amplifying the pro-viral DNA making it detectable. PCR can be used for diagnosing HIV infection in infants and also measuring active replication of the virus by detecting viral RNA in plasma. PCR detects the presence of HIV pro-virus and therefore is not affected by persistent maternal antibody(52).

## ***2.3.2 CLINICAL DIAGNOSIS***

The clinical diagnosis of HIV-1 infection in children is difficult. The World Health Organisation(WHO) has developed guidelines for recognising HIV-1 infection in children and the diagnosis is made if the following are present(19).

1. Any cardinal finding
2. Two or more characteristic findings
3. One characteristic finding plus two or more associated findings.
4. Three or more associated finding plus any epidemiological risk factors
5. Two associated finding plus laboratory evidence of HIV infection in the child.

### ***Cardinal Signs***

- Pneumocystis Carinii pneumonia (PCP)
- Lymphoid interstitial pneumonia (LIP)
- Fungal infection in the throat and mouth
- Kaposi Sarcoma

### ***Characteristic findings***

- Recurrent bacterial or viral infections (e.g respiratory, skin infections and meningitis).
- Tuberculosis of the lung or of other organs.
- Shingles (Herpes Zoster).
- Cytomegalovirus infection.
- Neurological problems, such as slowness in developing skills in sitting, crawling and talking.

### ***Associated Signs***

- Oral thrush when the child is not being treated with antibiotics.
- Failure to thrive.
- Fever (continuous or intermittent for more that 1 month).
- Diarrhoea.
- Generalized lymphadenopathy.
- Skin rashes.

## ***Epidemiological Risk Factors***

- Mother has tested positive for HIV-1.
- History of transfusion with unscreened blood or blood products.
- Sexual abuse involving penetrative sexual intercourse.
- Use of contaminated syringes and needles or a history of circumcision using non sterile instruments.

## ***Definition of AIDS in Zambian children***

The diagnosis of HIV-1 in children presents a challenge to clinicians. There are certain clinical manifestations which occur more frequently among those infected with HIV-1. The Zambian case definition for suspecting or diagnosing AIDS in children is categorized into clinical signs/symptoms that are grouped into majors and minors (56).

### **Major Criteria includes:-**

Recurrent fever >1 month.

Recurrent oropharyngeal candidiasis.

Recurrent pulmonary infections

### **Minor criteria includes:**

Chronic diarrhoea >1 month.

Weight loss or abnormally slow growth.

Generalized lymphadenopathy.

Persistent coughing >1 month.

Extra pulmonary tuberculosis.

Pneumocystis carinii pneumonia.

Confirmed maternal HIV-1 infection.

Paediatric AIDS is suspected in an infant presenting with 'two major and two or more minor signs and symptoms', in the absence of a known cause of immunodeficiency.

## 2.4 PREVENTION/ INTERVENTION.

Until more effective therapy for HIV infection is available, prevention is the only means to control this disease. A more specific prevention mode in paediatrics is interruption of perinatal transmission. Results of a multicentre placebo controlled trial (AIDS clinical Trial Group Protocol # 076) using Zidovudine (AZT,ZDV) 100mg orally five times/24 hours in HIV-1 pregnant women as early as 14 weeks of gestation through delivery and in their newborns (180 mg per metre square orally every 6 hours) for the first six weeks of life showed that vertical transmission was reduced from 25.5 percent in the placebo recipients to 8.3 percent in ZDV recipients(57).

Recently a placebo controlled study in Thailand of "short course" of oral ZDV started at 36 weeks (300mg bid)+ continuing through labour and delivery(300mg q3h) showed a reduction in transmission from 19 percent to 9 percent(58). Toxicity from ZDV therapy in both the mothers and infants was minimal. Studies utilizing HIV antibody concentrate(HIVIG) are in progress to further reduce perinatal transmission. Several studies evaluating the role of route of delivery demonstrated a slightly decreased transmission rate among women delivered by cesarean section, although the statistical significance was marginal(15).

An HIV-1 vaccine that can prevent infection or development of HIV disease is the ultimate goal of prevention. An effective vaccine appears to be in a distant future. A diagnosis of paediatric AIDS is almost a diagnosis of a family with HIV infection. The clinician should take responsibility to counsel the family. Counselling is a problem solving and decision making process that involves the counsellor and the client. The counsellor should be skilled in listening, supporting and guiding. Health education should be given to young people to prevent sexual transmitted diseases (STDs) which have a great influence on HIV transmission. A recent randomised clinical trial in Mwanza, Tanzania documented a 46 percent reduction in the incidence of HIV after effecting a comprehensive management of STDs at primary health care level(59).

## **MANAGEMENT.**

A multi disciplinary team approach is essential for successful management of paediatric HIV. It includes antiretroviral therapy, prophylaxis and treatment of opportunistic infections, nutrition, immune boosters and preventive isolation.

### **Antiretroviral therapy.**

The goal of antiretroviral treatment is to decrease or stop viral replication for as long as possible, reducing the chance that the virus will produce mutations that allow HIV to multiply despite therapy(60). This is achieved by early treatment, using combinations of antiretroviral drugs, preferably including one that enters the CNS. Complete viral suppression with "Highly Active Antiretroviral Therapy" (HAART) for symptomatic children, regardless of their CD4+

count or children with a significantly decreased CD4+ count for age is mandatory (60). By combining treatment from different classes of antiretroviral drugs HIV is attacked at several stages in the process of replication. The three classes of therapies currently available are: Nucleoside reverse transcriptase inhibitors (NRTIS), Protease inhibitors (PI) and non-nucleoside reverse transcriptase inhibitors (NNRTIS). For achieving maximum suppression of HIV, at least two nucleoside reverse transcriptase inhibitors (NRTIS) and a protease inhibitors(PI) are used(60). Currently, two antiretroviral drugs are licensed for use in HIV-1 infected children. Zidovudine(ZDV), at a maximum dose of 180mg per meter square is administered every 6 hours and dideoxyinosine (ddI),100 mg per meter square, is given daily(60).

These drugs reduce the HIV-1 load significantly and are associated with increased CD4+ lymphocyte count and clinical improvement. Both drugs cause mild neutropenia, but a macrocytic anaemia is associated with ZDV, and pancreatitis occurs in small proportion of children treated with ddI. An example of NNRTI drug in use for adults infected with HIV-1 is Nevirapine (60).

### **Treatment of opportunist infection.**

HIV infected children respond very well to standard bactericidal antibiotics(61). Despite the impaired cell mediated immunity, response to anti tuberculosis drugs in children with HIV infection is excellent if appropriately selected and instituted in a timely manner. Three drug regimen is used in the initiation phase(isoniazid, rifampin and pyrazinamide). At two months

pyrazinamide is stopped while rifampin and INH are continued for another four months. Trimethoprim-sulfamethoxazole(TMP-SMX) is the first line antimicrobial agent for treatment of PCP. Intravenous pentamidine is highly toxic(60). Oropharyngeal candidiasis usually responds readily to topical agents such as nystatin or miconazole oral gel. Ketoconazole is usually added to treat oesophageal and oropharyngeal candidiasis. Viral infections treated in paediatric AIDS include cytomegalovirus which is treated with ganciclovir(62).

### **Nutrition.**

Maintenance of nutritional status and fluid balance are important in children infected with HIV. Studies on food intake in patients with malabsorption, with or without AIDS have shown that decreased intake contributes significantly to the negative caloric balance and that adaptive hyperphagia does not occur(63). Standard polymeric formula diets generally are tolerated poorly, but elemental diets may lead to less diarrhoea(63). Appetite is a problem with elemental diets, but therapy may lead to weight stabilisation or gain. In refractory cases, parenteral hydration and nutrition should be employed(63). Nutritional support is less effective in patients with enterocolitis associated with systemic infections than in children with malabsorptive diseases due to associated metabolic derangements. Anorexia is mediated in the CNS by cytokines(63).

### **Immunity and immune boosters.**

HIV-1 infected children should receive close monitoring, good nutrition and appropriate immunization(64). The immune system in children with human immunodeficiency virus (HIV)

infection is deficient and when immunizing such children, the questions which should be considered are:

1. Is it effective to vaccinate the children.
2. Is it safe to vaccinate HIV infected children.

Despite the theoretic concern that antigenic stimulation from vaccine administration could lead to an increased risk of HIV replication, it is accepted that immunizations are an important part of well baby care for all HIV seropositive infants (65). In 1991 World Health Organization (WHO) issued guidelines for immunisation of HIV-1 infected infants and children.

It is recommended that diphtheria, pertussis, tetanus vaccine should be administered as usual and inactivated polio vaccine for these children (and their family members) as there is potentially an increased risk of paralytic disease among live polio vaccine recipients who are immune compromised(66). It is also recommended that asymptomatic HIV infected children be given measles vaccine and that administration of this vaccine also be considered in those with symptomatic infection. This is because of the high mortality and morbidity from natural measles that have been reported in HIV infected children. The guidelines stipulate that BCG(Bacillus Calmete Guerin) can be given to individual with asymptomatic HIV-1 infection. The safety of BCG or lack of it should only be one element in the debate about TB control strategies(65,66). The efficacy of BCG in HIV infected children is not established and will be difficult to study, given the highly variable efficacy of BCG in various HIV uninfected population(66).

Dysgammaglobulinaemia and rarely hypogammaglobulinemia that occur in paediatric AIDS coupled with heightened frequency of serious bacterial infections calls for use of immune boosters. Administration of intravenous immunoglobulins have been shown to be helpful. Intravenous immunoglobulins (IVIG) has been used for prophylaxis against recurrent bacterial infections in children whose CD4+ count was less than 200 per cubic millilitre(67).

Based on advances in our understanding of the timing and pathogenesis of vertical HIV infection, a variety of strategies to prevent the vertical transmission of HIV have been proposed. The important particular strategies are those which can easily be implemented in developing countries. A study from Malawi reported an increased risk of vertical HIV transmission with maternal Vitamin A deficiency (67). Potential explanation for the protective activity of vitamin A would include its role in the maintenance of mucosal surfaces, its role in B and T cell immunity and the potential role of retinoids in the regulation of viral replication.

### **Preventive isolation.**

Body substance isolation (BSI) is used for infection control(68). BSI incorporates the principle of universality( i.e for all patients), moist and potentially infectious body substances, such as blood, feces, urine, sputum, saliva, wound drainage and other body fluids should be treated with care. Gloving is recommended before contact with mucous membranes and nonintact skin and for anticipated contact with moist body substances . Hands are to be washed after glove removal(68).

## CHAPTER THREE

### OBJECTIVES AND METHODOLOGY

#### 3.1 OBJECTIVES

##### **Primary objective:**

To study the HIV-1 seroprevalence and outcome among children admitted at the University Teaching Hospital (UTH), Lusaka.

##### **Secondary Objectives:**

To compare the socio-economic characteristics, disease pattern and hospital outcome between children who are seropositive for HIV-1 and their controls who are seronegative for HIV-1.

#### 3.2 *STUDY DESIGN*

The study was a cross-sectional survey evaluating disease presentation among HIV-1 seropositive and seronegative children admitted to the paediatrics department.

#### 3.3 *SAMPLE SIZE*

The sample size was calculated using an estimated prevalence of HIV seropositivity of between 25-30 percent, with an estimated power of 80 percent and a 95 percent Confidence Level. The estimated sample size was 288 children(69).

#### 3.4 *STUDY SUBJECTS*

Children admitted to the department of Paediatrics and Child Health at the University Teaching Hospital (UTH) were selected for the study. Recruitment was done by systematic random sampling 24 hours a day at the out patient department. Every fifth patient admitted was enrolled. The study was conducted for three weeks, 22<sup>nd</sup> November, 1995 to 15<sup>th</sup> December, 1995.

### **3.5 MANAGEMENT OF STUDY SUBJECTS**

A verbal consent for participation in the study was obtained from the guardian of the child on enrollment into the study. Parents who consented were interviewed by using a standardized questionnaire (Appendix). The socio-economic status of the children were assessed by determining the parent's educational level, family income and housing. Five millilitres of blood was collected for the purposes of full blood count, malaria parasite slide and HIV-1 testing. HIV test was done as per Zambian criteria for HIV testing(70 ). HIV-1 test separated the study population into two groups, those who are HIV-1 seropositive and those that were HIV-1 seronegative.

The admitted children were followed up in the wards until they were discharged or died. The final diagnosis was recorded at the time of discharge or death. The diagnoses in HIV-1 positive and HIV-1 negative children were compared.

### **3.6 DEFINITIONS**

The following working definitions were used:

#### ***Respiratory tract infection (RTI)***

Cough or difficult in breathing with/without an increase in respiratory rate for the particular age group.

#### ***Protein energy malnutrition(PEM)***

PEM was defined by the Wellcome classification based on signs of marasmus, kwashiorkor or marasmic kwashiorkor.

#### ***Gastro-enteritis(G/E, Diarrhoeal disease)***

The standard WHO definition of presence of three or more loose stools in 24 hours.

## ***Malaria***

Strong suspicion based on the presence of fever, varying degrees of anaemia with/without splenic enlargement plus either presence of parasites on blood film or prompt response to antimalarial therapy.

## ***Measles***

The presence of dry cough, running nose, sneezing, redness of the eyes and excessive lacrimation followed by maculopapular rash.

## ***Anaemia***

The presence of pale mucous membranes with hemoglobin concentration less than 10g/dl.

### ***3.7 INCLUSION CRITERIA***

All children admitted to Paediatrics department in A - Block UTH (excluding those admitted to Neonatal Intensive Care Unit - NICU) who were below 15 years of age and whose parents consented for inclusion in the study.

### ***3.8 STUDY SETTING***

The study was conducted at the University Teaching Hospital (UTH) in Lusaka. The UTH is the main referral hospital for adults and children. UTH also acts as a primary health facility for the million plus people who live in Lusaka because of logistical problems and medicinal shortages encountered in the urban clinics around Lusaka. The study was under taken at the department of paediatrics and child health, UTH which attends to children below fifteen years of age. In the department the largest number of patients are seen during the period from October to February, with an average of two thousand to two thousand five hundred children being admitted to the department per month.

### **3.9 ADMISSION POLICY**

Children coming for treatment were first seen and screened in the out patient department. Those requiring admission were admitted to the admission ward which caters for all the new admissions during the first 24 hours. From the admission ward children were transferred to wards designated to individual groups of doctors headed by a consultant. Patients for this study were enrolled at the time of admission in the outpatient department and were then followed up in the respective wards.

### **3.10 SPECIMEN COLLECTION**

Five milliliters of blood was collected by peripheral vein puncture from each child and labeled accordingly. The blood was processed at the laboratories in UTH. Haematological studies were done using the Cobus Coulter to determine total white cell count and haemoglobin. Differential white cell count was done manually. In the routine of collecting blood for full blood count, a malaria parasite slide was included.

### **3.11 DATA COLLECTION**

A standard questionnaire was used. The questionnaire included child's age, sex, mother's educational status, parents residential address and income. A detailed physical examination was carried out at the time of admission

#### ***Follow up***

Children were followed up into the wards and reviewed everyday until the child was discharged or died. Definitive diagnosis was reached at in the ward.

### **3.12 DATA MANAGEMENT**

The software Epi Info version 6.0 was used for data analysis. Odds ratios were utilised to test for significance of differences in the variables.

### **3.13 ETHICAL CONSIDERATION**

The project was presented and cleared by the School of medicine, University of Zambia (UNZA) Research and Ethics Committee.

### **3.14 HIV-1 TESTING**

This was done using two methods. The first method was by employing an ELISA test Vironistika. This was counter checked by using an Agglutination test-Capillus to consolidate the HIV results. Vironistika anti-HIV uniform is an in Vitro diagnostic kit for the detection of antibody to human immunodeficiency virus (Anti-HIV) in human serum or plasma. Capillus HIV 1 and HIV 2 is designated to be used on freshly collected sample of sera. It has a sensitivity of 100.0 percent (98-100.0) and specificity of 99.8 percent (98.2-100). Vironistika HIV uniform has a sensitivity of 100.0 (97.6 - 100.0) and specificity of 99.5 (97.3 - 100.0).

#### ***Principle of the test***

The test is an enzyme Immunoassay based on a one step competitive inhibition principle. The procedure comprised the following steps.

1. Patients and control serum samples were pipetted into the wells.
2. Conjugate was pipetted into each well with sample or control.
3. Mixing was done by gently tapping the side of the strip holder and incubation at 37c for 90 minutes is done.
4. Wells were washed four times.
5. Substrate was pipetted into each well.
6. The mixture was incubated at 20 to 25c in a dark place for 30 minutes
7. The reaction was stopped by adding sulphuric acid to each well.
8. Reading of the absorbance of the solution in the wells at 492nm was done.

To further confirm a positive result, a second HIV test called capillus was done.

***The assay procedure for capillus was that:-***

1. The latex reagent was mixed well to ensure that the latex suspension is homogenous.
2. Test sample or control was pipetted.
3. Disperse sample was directed into latex solution and mixing of sample and latex was done.
4. The pipette tip was used continuously to move the well mixed sample and latex solution to the opening of the channel until the capillary flow begun.
5. The latex mixture was allowed to flow through the entire capillary channel and into the viewing window before interpretation of results. This required approximately 3.7 minutes.
6. Agglutination was observed at the viewing window. Sample demonstrating any latex agglutination were considered reactive.

## CHAPTER FOUR

### RESULTS

#### 4.0 BACKGROUND

##### *Recruitment.*

During the study period from 22<sup>nd</sup> November to 15<sup>th</sup> December, 1995(three weeks) there were 2,011 paediatric admissions, out of which 303(15 percent) children were enrolled into the study. Ninety-nine parents(25%) did not allow their children to join the study.

##### *Sex distribution.*

Among the 303 children enrolled, 157(51.8 percent) were boys and 146(48.2 percent) were girls. The difference in sex distribution was not statistically significant(p value 0.16).

##### *Age distribution.*

The age distribution for the study population was 39 children aged 0-6 months, 70 children aged 7-12 months, 50 children aged 13-18 months, 99 children aged 19-59 months, 34 children aged 5 -9 years and 13 children were aged 10 years and above.

To understand the dynamics of HIV seroprevalence in children of different age groups the children were categorized in age groups as above i.e 0-6 months, 7-12 months, 13-18 months, 19-59 months, 5 to 9 years and above 10 years. Among these children 109(36 percent) were below 1 year of age and the majority (84.5 percent) were aged below 5 years. Only 15.5 percent were in the age group of 5 to 14 years(figure 1). Correspondingly the HIV-1 seroprevalence in same age groupings are shown both in figure 2 and table 4.2A.

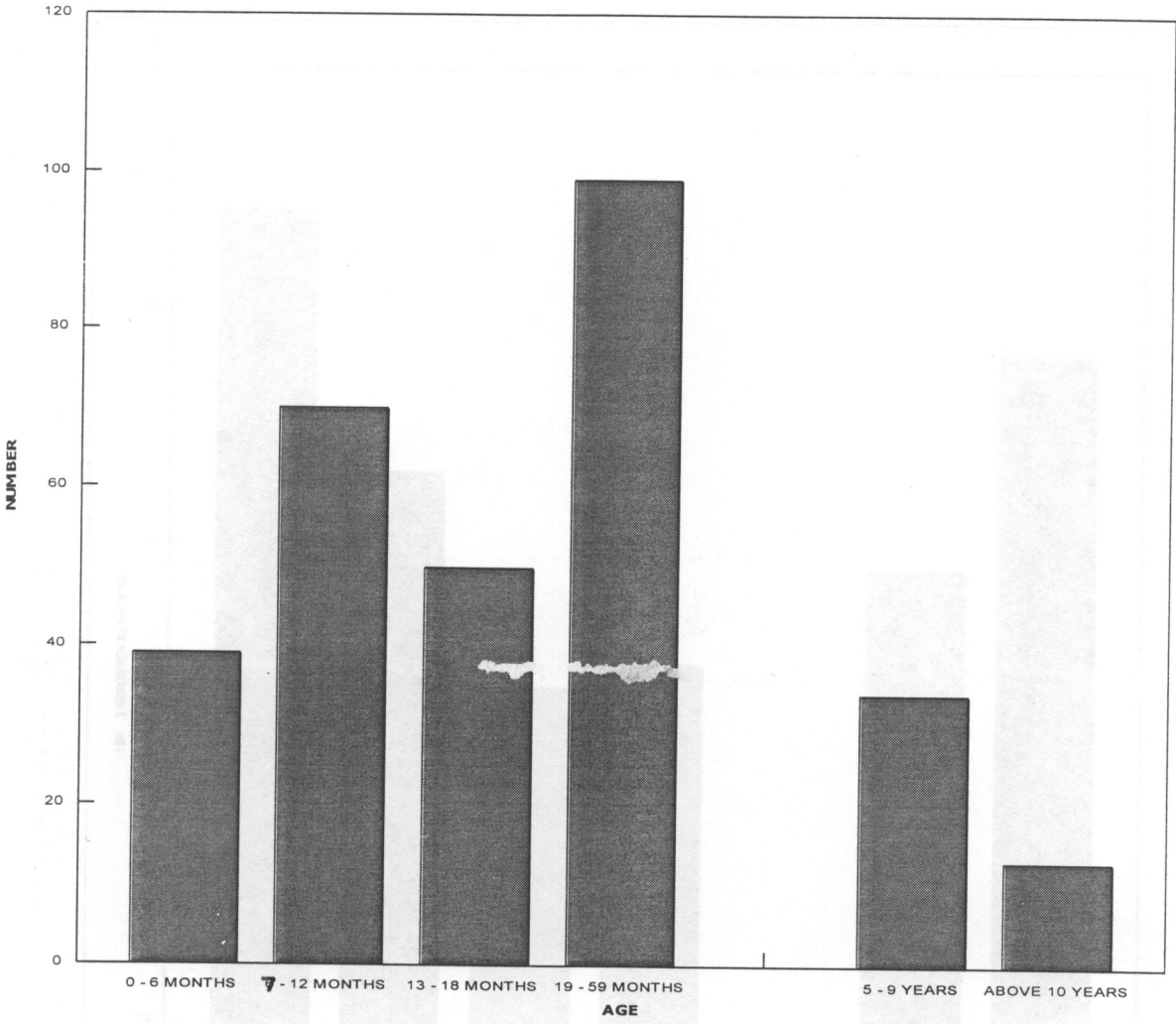


FIGURE 1 SHOWS THE AGE DISTRIBUTION OF STUDY POPULATION

of HIV-1 seroprevalence for the children in this study was 31.4 percent. The

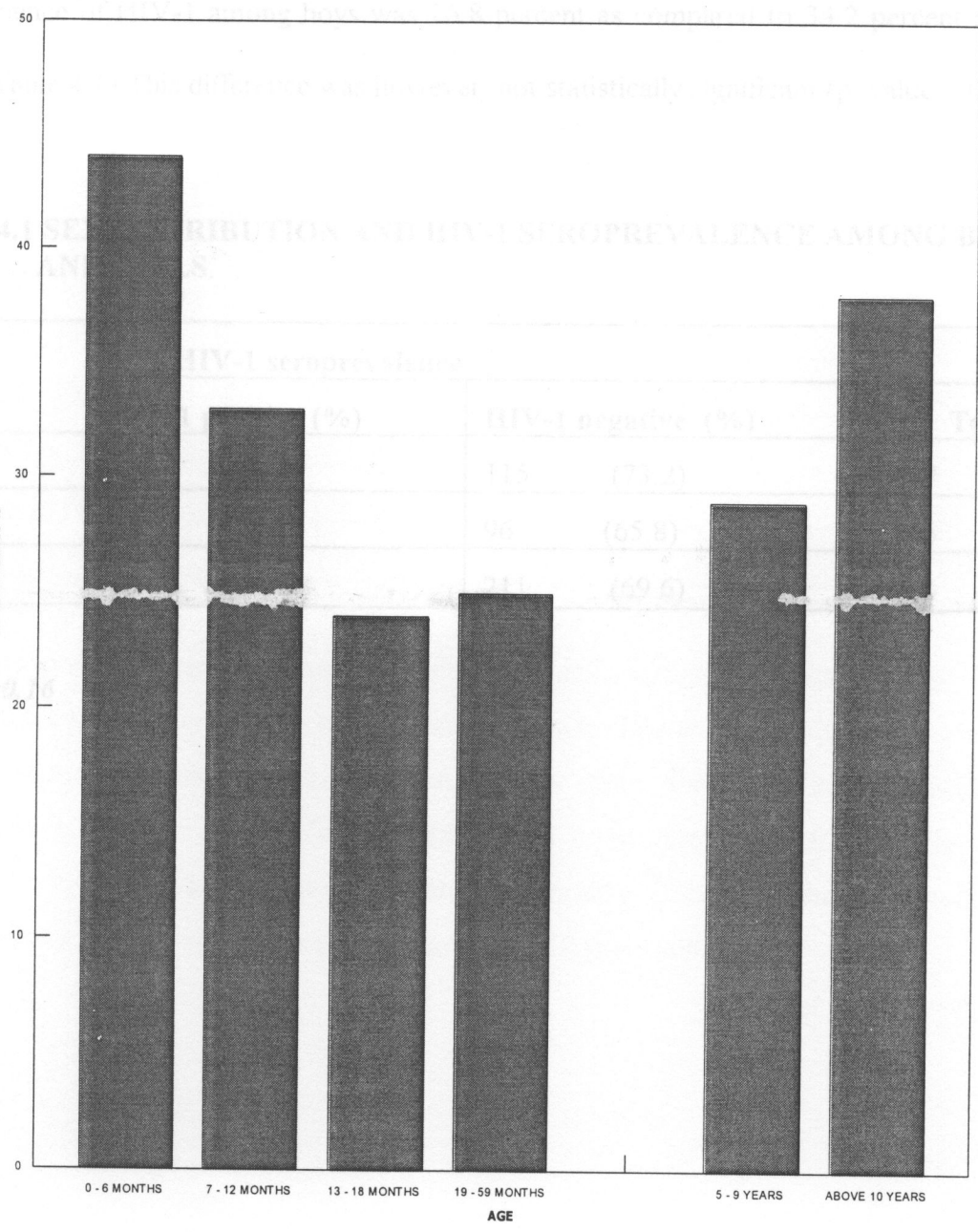


FIGURE 2 SHOWS THE HIV - 1 SEROPREVALENCE IN RELATION TO AGE

#### 4.1 SEROPREVALENCE

The overall HIV-1 seroprevalence for the children in the study was 30.4 percent. The seroprevalence of HIV-1 among boys was 26.8 percent as compared to 34.2 percent among the girls (Table 4.1). This difference was however, not statistically significant ( $p$  value = 0.16).

**TABLE 4.1 SEX DISTRIBUTION AND HIV-1 SEROPREVALENCE AMONG BOYS AND GIRLS.**

Sex	HIV-1 seroprevalence		
	HIV-1 positive (%)	HIV-1 negative (%)	Total
Male	42 (26.8)	115 (73.2)	157
Female	50 (34.2)	96 (65.8)	146
Total	92 (30.4)	211 (69.6)	303

*P* value = 0.16

#### 4.1.1 AGE SPECIFIC HIV-1 SEROPREVALENCE

**TABLE 4.2A: AGE SPECIFIC HIV SEROSTATUS OF THE STUDY POPULATION ACCORDING TO HIV-1 SEROSTATUS.**

Age in months/years	HIV-1 seroprevalence		
	HIV-1 Positive (%)	HIV-1 Negative(%)	Total
0-6 months	17 (43.6)	22 (56.4)	39
7-12 months	23 (32.8)	47 (67.2)	70
13-18 months	12 (24.0)	38 (76.0)	50
19-59 months	25 (25.3)	72 (74.7)	99
5-9 years	10 (29.4)	24 (70.6)	34
10 years & above	5 (38.5)	8 (61.5)	13
Total	92 (30.4)	211 (69.6)	303

HIV-1 seroprevalence was analysed according to specific age groupings(table 4.2A). For the sake of defining the seroprevalence much more closely in children 18 months and below whose antibody status might only indicate maternal antibody status, these children were stratified in six months groupings. The results indicate a drop in seroprevalence from 46 percent in children 0-6 months to 24 percent in children 13-18 months. In children above 18 months, the results show a high seroprevalence in the age group 10 years and above.

**TABLE 4.2B: HIV SEROPREVALENCE IN CHILDREN OVER 18 MONTHS  
(HIV-1 INFECTED)**

Age in months/years	HIV-1 positive (%)	HIV-1 negative (%)	Total
<18 months	52 (32.7)	107 (67.3)	159
>18 months	40 (27.8)	104 (72.2)	144
Total	92 (30.4)	211 (69.6)	304

The prevalence of HIV-1 infection among hospitalised children was determined by estimating the serostatus of children above 18 months. The results indicate that over a quarter(27.8 percent) of the children admitted to UTH were HIV-1 infected.

## 4.2 SOCIO-ECONOMIC BACKGROUND.

In this analysis educational level was used as a proxy for socio-economic status in the women. Considering that over 90 percent of HIV-1 infection in children is acquired through mother to children transmission, the serostatus of children was evaluated according to education attainment of the mother in order to determine whether education influenced vulnerability to HIV-1 infection in women.

**TABLE 4.3A: THE EDUCATIONAL LEVEL OF MOTHERS WITH RESPECT TO HIV-1 SEROPREVALENCE OF THEIR CHILDREN.**

Mother's educational level	HIV-1 seroprevalence in children		
	HIV-1 positive (%)	HIV-1 negative (%)	Total
None	5 (15.6)	27 (84.4)	32
Primary school	46 (28.8)	114 (71.2)	160
Secondary school	33 (36.3)	58 (63.7)	91
College & higher	5 (41.7)	7 (58.3)	12
Not stated	3 (37.5)	5 (62.5)	8
<b>Total</b>	<b>92 (30.4)</b>	<b>211 (69.6)</b>	<b>303</b>

The results indicate a trend towards more HIV-1 infection in women who had higher educational level(table 3A). This trend is also observed when children in infected children above 18 months. Among the sick and hospitalised children, therefore higher HIV-1 seroprevalence was observed in those children born to mothers with higher educational level (p value=0.05). (table 3B).

**TABLE 4.3 B. EDUCATIONAL LEVEL OF MOTHERS OF CHILDREN WHO WERE 18 MONTHS AND ABOVE WITH RESPECT TO HIV SEROSTATUS.**

Mother's educational level	HIV-1 seroprevalence in children.		Total
	HIV-1 positive (%)	HIV-1 negative (%)	
None	0 (0)	14 (100.0)	14
Primary school	25 (33.8)	49 (66.2)	74
Secondary school	15 (36.6)	26 (63.4)	41
College & higher	3 (42.8)	4 (57.2)	7
Not stated	3 (37.5)	5 (62.5)	8

For analysis mothers were grouped according to their educational attainment thus no formal education or primary school education was grouped as low educational level while secondary, college and higher education was labeled as high educational level. When the educational level in two groups were analysed in relation to HIV seroprevalence of their children it was observed that HIV seroprevalence rate among children increased corresponding to their mothers educational level. p value 0.05

**DISEASE PATTERN OF ADMITTED CHILDREN.**

**TABLE 4.4: DISEASE PRESENTATION OF STUDY POPULATION COMPARED TO TOTAL ADMISSIONS DURING STUDY PERIOD.**

<b>Disease</b>	<b>Study population (%)</b>	<b>Total admissions (%)</b>	<b>Odds ratio</b>	<b>95% C.I.</b>
<b>RTI</b>	<b>79 (26.0)</b>	<b>567 (28.0)</b>	<b>0.9</b>	<b>0.7-1.2</b>
<b>PEM</b>	<b>63 (20.8)</b>	<b>343 (17.0)</b>	<b>1.3</b>	<b>0.9-1.7</b>
<b>Malaria</b>	<b>63 (20.8)</b>	<b>277 (14.0)</b>	<b>1.6</b>	<b>1.2-2.3*</b>
<b>G/E</b>	<b>52 (17.2)</b>	<b>477 (24.0)</b>	<b>0.7</b>	<b>0.5-0.9</b>
<b>Measles</b>	<b>22 (7.2)</b>	<b>86 (4.0)</b>	<b>1.8</b>	<b>1.1-2.9*</b>
<b>Anaemia</b>	<b>12 (4.0)</b>	<b>45 (2.0)</b>	<b>1.8</b>	<b>0.9-3.8</b>
<b>Others</b>	<b>12 (4.0)</b>	<b>211 (11.0)</b>	<b>0.3</b>	<b>0.2-0.6</b>
<b>Total</b>	<b>303 (100.0)</b>	<b>2,011 (100.0)</b>		

\* significant

The disease distribution observed during the study period was similar to that seen in general paediatric admissions. Malaria and measles cases were higher in the study population as compared to the overall admissions. The reason for this observation was because the study was conducted during the malaria season and at a time when there was an out break of measles (Table 4.4).

**TABLE 4.5 CLINICAL DIAGNOSIS WITH RESPECT TO HIV-1 SEROSTATUS**

Diagnosis	HIV positive %		HIV negative %		Odds ratio	95% C.I
RTI	32	(34.8)	44	(20.8)	1.9	1.1-3.3*
PEM	19	(20.7)	44	(20.8)	1.0	0.5-1.9
G/E	12	(13.8)	40	(19.0)	0.6	0.3-1.4
Malaria	10	(10.9)	53	(25.1)	0.4	0.2-0.8*
Anaemia	7	(7.6)	5	(2.4)	3.4	0.9-12.7
Measles	6	(6.5)	16	(7.6)	0.8	0.3-2.2
Others	6	(6.5)	9	(4.3)	2.4	0.7-8.6
Total	92	(100.0)	211	(100.0)		

\* significant

The HIV-1 serostatus was analysed in relation to disease pattern(table 4.5).The diseases found to be associated with HIV-1 serostatus were respiratory tract infection and malaria. Respiratory infection was higher among the HIV-1 seropositive children, 34.8 percent compared to 20.8 percent in the HIV-1 seronegative children(O.R 1.9;95% C.I. 1.1-3.3). It is interesting to note that clinical malaria was significantly lower amongst the HIV-1 seropositive children (10.9 percent) when compared to the children who were HIV-1 seronegative(25.1 percent)(O.R 0.4;95% C.I. 0.2-0.8).Anaemia was noted to be more common in the seropositive children (7.6 percent) though this difference was not statistically significant.

### 4.3 HOSPITAL OUTCOME

TABLE 4.6: HOSPITAL OUTCOME IN THE STUDY POPULATION.

HIV Serostatus	Outcome		
	Discharged (%)	Died (%)	Total
Positive	76 (84.4)	14 (15.6)	90 (100.0)
Negative	185 (90.7)	19 (9.3)	204 (100.0)
Total	261 (88.2)	33 (11.8)	294

p value 0.009

The overall mortality for the study was 11.0 percent. The mortality among HIV positive children was 15.6 percent as compared to 9.3 percent in HIV negative children. This difference was statistically significant (p value = 0.009).

**TABLE 4.7: COMPARISON OF CAUSES OF DEATH IN RELATION TO HIV-1 SEROSTATUS.**

Cause of death	HIV-1 positive (%)	HIV-1 negative (%)
RTI	6 (42.9)	2 (10.5)
PEM	4 (28.6)	11 (57.9)
G/E	2 (14.3)	3 (15.8)
Malaria	1 (7.1)	2 (10.5)
Measles	1 (7.1)	1 (5.3)
Total	14 (100.0)	19 (100.0)

Whereas respiratory tract infection was the number one cause of death in children who were HIV-1 seropositive, malnutrition was found to be the major killer amongst the HIV-1 negative children.

## CHAPTER FIVE

### DISCUSSION

#### 5.1 SEROPREVALENCE

This study was conducted between the period 22 November, 1995 to 15 December, 1995 and 303 children were enrolled in the study out of 2,011 total admissions. The study population composed of 157 boys and 146 girls. The overall HIV-1 seroprevalence was 30.4 percent and the HIV-1 seroprevalence for boys was 26.8 percent while that for girls was 34.2 percent. The HIV-1 seroprevalence difference between the boys and girls was not statistically significant ( $p$  value=0.16). Table 4.1. The study population was divided into two groups according to age using a cut off point of 18 months. There were 144 children who were aged 18 months or more and 159 children who were less than 18 months of age. The HIV-1 seroprevalence in the two groups were 27.8 percent and 32.7 percent respectively (table 4.2B). The HIV-1 seroprevalence in the two groups were different in that most of the children aged less than 18 months were assumed to be carrying HIV-1 antibodies passed passively from their mothers in utero while the children aged more than 18 months produced their own HIV antibodies. The HIV-1 seroprevalence in this age group (32.7 percent) indicate that one third of the children aged less than 18 months were HIV-1 exposed or born from HIV-1 positive mothers. This is in agreement with the HIV-1 seroprevalence in antenatal mothers in Lusaka.

In a study done by Fylkesnes et al in 1994 the HIV-1 seroprevalence rates at different antenatal clinics in Lusaka ranged from 28 percent to 36 percentage(4). In the same study they reported a high HIV seroprevalence rates among antenatal women in most of the major urban centers such as Ndola 27.5 percent, Kabwe 29.5 percent, Chipata 30.3 percent, Livingstone 31.9 percent, Mongu 28.4 percent and Solwezi 24.2 percent(4). In contrast, HIV prevalence rates were low in rural centers for example Mukinge 8.4 percent, Minga 9.6 percent, Macha 9.1 percent and Kalabo 10.2 percent. This clearly shows that HIV has spread more rapidly in urban population than in rural populations(4).

A study done by Hira et al in 1988 documented that the maternal to child transmission of HIV-1 at the University teaching hospital (UTH) was 39 percent(71). The implication of a high HIV-1 seroprevalence in antenatal clinics and a high maternal to child transmission rate will result in large numbers of paediatric HIV-1 infections. In this study the HIV-1 seroprevalence rate for children aged more than 18 months was 27.8 percent. The passive aternally acquired HIV antibodies usually last for 12-18 months. When a child aged more than 18 months shows a positive HIV-1 antibody test it means such a child is likely to be infected with HIV and is producing his/her own antibodies against HIV-1. It therefore follows that the true HIV-1 seroprevalence in this study was 27.8 percent. The seroprevalence of 27.8 percent is comparable to that which was found by Luo et al in 1991 which was 23.9 percent(35). The difference in the two studies is in the age groups which were under study. The Luo et al study had focussed on children whose age group were from 6 months to 59 months while this study included all paediatric age groups from the age of one month to fourteen years. The HIV-1 seroprevalence in this study for the age group 6 months to 59 months was 27.6 percent. The comparison of the two similar age groups in this study and the Luo et al study indicate an increase in HIV-1 seroprevalence from 23.9 percent in 1991 to 27.6 percent in 1995.

HIV-1 seroprevalence has been increasing in the paediatric admissions at UTH and this trend has been observed also in the children diagnosed with tuberculosis. HIV-1 seroprevalence has been observed to have increased in children with tuberculosis from 24 percent in 1989 to 56 percent in 1991(6). High HIV-1 seroprevalence rate in children is a direct reflection of high HIV seroprevalence in women in of child bearing age. Most children get HIV-1 infection from their mothers by vertical transmission(8).

Throughout the world the number of women infected with HIV-1 is increasing but it is more pronounced in sub-saharan Africa(2). Table 4.2A shows an age specific HIV-1 seroprevalence. HIV seroprevalence reduced from birth to 18 months from 43.6 percent to 24.0 percent. This is due to the decline in maternally acquired antibodies. The seroprevalence remained static at 25.3 percent from the age of 19 to 59 months. There was an increase in

HIV seroprevalence in the age groups 5 to 9 years and that above 10 years. The seroprevalences were 29.4 percent and 38.5 percent respectively. The total admissions in the age groups 5 to 9 years and above 10 years were 11.2 percent and 4.3 percent respectively. Most of the children admitted were aged under five years(84.5 percent). This is consistent with overall paediatric admissions in developing countries(72).

In our study none of the HIV infected children gave a history of blood transfusion, traditional scarifications or had undergone surgical procedures. This implies that all of the children in the study got HIV infection by MTCT. Fifteen children who were five years and above represent the long term survivors among the perinatally infected group. There was a high HIV seroprevalence for children aged more than ten years. The explanation for this observation was probably related to small number of children seen in this age group. These children have chronic HIV infection(19).

## **5.2 SOCIO-ECONOMIC STATUS**

This study compared the socio-economic characteristics among children who were HIV seropositive and HIV seronegative. These included parental educational levels, family income, housing and sanitation(see Appendix). Unfortunately most mothers could not provide reliable information on family income as they were not aware of their husbands earnings. Some of the mothers were single and were staying with their relatives. For purposes of analysis of socio-economic status of the parents the educational status of the mother was used as a proxy for socio-economic status of the children or their families. We considered those children born to mothers with no formal education or primary education as belonging to a low socio-economic status while those born to mothers with secondary or higher education as belonging to medium or high socio-economic status. It was observed that HIV seroprevalence rate among children was related to their mothers educational level.(Table 4.3A and 4.3B) HIV seroprevalence among the mothers were as follows: no formal education 15.6 percent, primary education 28.8 percent, secondary education 36.3 percent and college or higheducation 41.7 percent. The same trend was observed when mothers educational status was considered for children aged 18 months and above.

The observation above is consistent with the study done by Fylkesness et al, 1995 who found that in Zambia the trends of infection with HIV-1 showed a steep increase by educational attainment both in urban and rural areas(72). In this study it was observed that a child infected with HIV-1 could be an index case in a family infected with HIV-1. This therefore acts as a chance to counsel the parents about HIV-1 and probably carry out an HIV-1 test in them. One of the explanation of why children from mothers of high socio-economic status were more infected with HIV than those from low socio-economic status could be that the progression time from HIV-1 infection to AIDS is presumably longer among the higher educational groups with good living conditions and nutrition(72). The other explanation could be that of bias in the study due to the class of women patronising the UTH.

Since the introduction of fee paying schemes in hospitals which was done in September, 1995 only women who can afford paying the fees being charged took their children to hospitals. This in turn might have lead to more children from the high socio-economic class being enrolled in the study than children from low socio-economic class. What this really means is that there could be differences in health seeking behaviors in the two social classes related to their purchasing power. If women from low socio-economic class are not bringing their children to hospital then their children may be receiving treatment elsewhere or are dying at home. A high HIV seroprevalence in the high socio economic group is very detrimental to the national development as this results in loss of manpower in the productive age group.

### 5.3 DISEASE PRESENTATION

The disease presentations that were observed in this study were respiratory tract infection (RTI) (26.0 percent), protein energy malnutrition (PEM) (20.8 percent), malaria (20.8 percent), gastro-enteritis(G/E) (17.2 percent), measles(7.2 percent) and anaemia (4.0 percent). These diseases were observed comparable to the total paediatric admissions during the study period. These observations therefore show that the study population was representative of the paediatrics admissions during the study period.(Table 4.4)Malaria and measles cases were higher in the study population as compared to overall admissions.

The reasons for this observation was probably due to the fact that the study was done during a malaria season and at the time there was a measles outbreak. There was more Malaria in children who were HIV-1 negative as compared to those who were HIV-1 positive (25.1 percent versus 10.9 percent) and this observation was the opposite of what is known about HIV-1 infection with relation to Malaria. Worldwide Malaria is a major opportunistic pathogen in AIDS patients( 73 ).

RTI a common illness, was seen to be associated with HIV-1 seropositive children. This observation was in agreement with a study done by Chintu et al,1995 which found that there was a relationship between HIV-1 infection and respiratory tract infections(5). RTI in children with HIV-1 infection is caused by streptococcus pneumoniae and haemophilus influenzae just like in non HIV-1 infected children. Apart from these common RTI infections it has been observed that pulmonary tuberculosis is a frequent illness among HIV-1 infected children. However, the diagnosis of TB in children aged less than 5 years presents difficulties and as a result many children without TB are on anti TB treatment resulting in wastage of drugs. Chintu et al, 1993 observed a high HIV-1 seroprevalence among the children treated for tuberculosis at UTH(6)Protein energy malnutrition in this study was observed to be common in both HIV seropositive and sero negative children.(Table 4.5)The reason for this observation was that the study was conducted during the time when there was starvation and diarrheal diseases which leads to PEM. In Zambia malnutrition presents as a seasonal illness. It occurs from the

November to March of each year. Chela et al, 1990 in rural Zambia identified PEM as a causation of a high morbidity and mortality in children who were HIV-1 infected(48).

Gastroenteritis was also observed to be common in both HIV seropositive and HIV seronegative children. The study was done during the rainy season at the time when diarrhoea is common. However, the point to note is that acute gastroenteritis(diarrhoea) has not been associated with HIV-1 infection as opposed to chronic gastroenteritis. The significance of anaemia in this study was due to the number of cases seen during the study period. There was no child in whom there was a history of blood transfusion. The causes of anaemia in HIV infection are numerous and include

#### **5.4 HOSPITAL OUTCOME.**

Thirty three children died in hospital during the study period, nine children absconded and the rest were discharged. The overall mortality rate in the study was 11.2 percent. Fifteen point six (15.6) percent of the children in the HIV-1 antibody positive group died compared to 9.3 percent in the HIV-1 antibody negative group. HIV-1 infection in a child had a detrimental effect on the hospital outcome of an admission.(p value=0.009)The causes of death were determined on the basis of clinical diagnosis. No postmortems were conducted to confirm causes of death. It is known that death in HIV-1 infected children is dependent on both clinical diagnosis and age at onset of an AIDS defining condition(9). Candida esophagitis and severe encephalopathy show a poor prognosis while parotitis and LIP have been associated with long survival(19).

Hira et al, 1989 found an overall mortality of 44 percent in HIV-1 infected children at age of two years(71). When an HIV-1 infected child comes to hospital the outcome is dependent on medical and psychological care being given by health workers. It is therefore paramount that health workers should be taught on how to look after HIV-1 positive children if the prognosis of such children is to improve. Despite its progressive nature, HIV infection per se is not the usual cause of death(8). Effective treatment of opportunistic infections will have a positive impact on survival. The respiratory tract infections that cause death in HIV-1 seropositive

children include P. carinii pneumonia, acute bacterial pneumonia, pulmonary tuberculosis and LIP.

## **5.5 CHALLENGES OF DIAGNOSING HIV IN CHILDREN AGED BELOW 18 MONTHS**

Diagnosis of HIV-1 infection in children should be done early so that interventions can be put in place. In this study a good number of children were aged less than 18 months. The diagnosis of HIV infection in this age group poses a challenge and can be done using PCR and HIV viral culture technique. These are sophisticated and expensive tests which are not available in most poor developing countries.

## **5.6 THE BURDEN OF HIV INFECTION**

The high HIV-1 seroprevalence in this study is of great concern to us, as it will lead to increased admissions to hospital and increased hospital mortality(9). There is an increased bed occupancy due to the chronicity of the disease. The need for extra standard drugs is adding an extra burden to the national drug programs which are already overstretched(64). At the community level high HIV seroprevalence will lead to a lot of man hours being lost as a result of mothers looking after their sick children. This is because most often it is the mothers who look after the sick children while they are expected to contribute to the bread basket of most family units through farming. HIV-1 infection in the older child leads to poor school attendance.

## **5.7 LIMITATIONS OF THE STUDY**

### **5.7.1. Sampling Bias**

- (a) The study population consisted of more children aged less than two years. This was disadvantageous when it came to determination of HIV-1 infection in such children as some of them may be testing positive for maternally acquired antibodies.
  
- (b) Socio-economic status was difficult to determine as originally planned because most mothers in the study could not give accurate information to the demographic questions that were asked apart from educational level of the mother.

### **5.7.2 Testing of HIV-1**

The HIV-1 testing was done by antibody test which is not very useful in diagnosing HIV-1 infection in children aged less than 18 months.

### **5.7.3 Validity of Results**

The results were marginally statistically significant. For strong results one needed to enroll and follow a big group of patients. This problem arose because the sample size was not calculated using children > 18 months.

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATION

#### 6.1 CONCLUSIONS AND IMPLICATIONS

- 1) The study shows that the HIV-1 seroprevalence in paediatric admissions at UTH for the period 22 November to 15 December, 1995 was 30.4 percent. For the ages below 18 months and those above 18 months the HIV-1 seroprevalence were 32.7 percent and 27.8 percent respectively. This observation indicate that HIV-1 seroprevalence was high in paediatric admissions which empirically could indicate a high HIV-1 infection in the children in the study.
- 2) The HIV-1 seroprevalence for the age group 6 months to 59 months in this study was 27.6 percent and when this is compared to the Luo et al, 1991 study there is a definite increase in the HIV-1 seroprevalence for the age group.
- 3) There was no difference in the HIV-1 seroprevalence between boys and girls in the study population. This finding indicate that HIV-1 affects both boys and girls equally.
- 4) A good number of children in this study who tested positive to HIV-1 were aged more than 5 years (15 percent). In conclusion this means that there are some children infected with HIV perinatally who live longer.
- 5) In this study the HIV seroprevalence was high(36.9 percent) among the children born to mothers with secondary or higher education as compared to 26.6 percent for children born to mothers with primary or no formal education. This finding indicate that the level of education in the mother has a bearing on the HIV serostatus of their children.
- 6) The common diseases that were seen in the study were RTI, PEM, malaria, G/E, measles and anaemia. These diseases were seen in the general admissions too and shows that the illnesses are common childhood diseases. The illnesses were not diagnostic of HIV.
- 7) The HIV-1 seroprevalence for children who had RTI was 34.8 percent and anaemia 7.6 percent. The two illnesses showed a significant association with HIV-1 seropositivity in the children.

- 8) The mortality rate in the HIV-1 seropositive children was 15.6 percent as compared to 9.3 percent in the HIV-1 negative children.
- 9) The major cause of death in HIV-1 seropositive children was RTI while that in HIV-1 seronegative children was PEM.

## 6.2 RECOMMENDATIONS

- 1) Health workers, administrators and policy makers should be made aware of the fact that among the paediatric admissions at UTH a quarter of them are HIV seropositive.
- 2) To reduce HIV infection in children efforts should be directed to reduce HIV infection among women of child bearing age by instituting :
  - (a) Adolescent health education.
  - (b) Offering HIV voluntary counseling and testing(VCT) to all the women and men of child bearing age before the women becomes pregnant. This will enable them to make right decision about pregnancy and child spacing.
  - (c) Intensifying HIV prevention messages to the educated and elite in society.
  - (d) There is need to develop/adopt tests that can diagnose HIV infection in children aged less than 18 months.
- 3) In view of the high HIV seroprevalence among the hospitalised children at UTH, HIV test should be offered routinely to the children and parents . This will assist in early identification of HIV infected children and their parents.
- 4) Parents of HIV infected children should be educated about the special needs that their children require in terms of nutrition, regular follow up and early recognition of opportunistic infections.
- 5) The high HIV-1 seroprevalence seen in antenatal mothers and reflected in children aged below 18 months should be managed through counseling by HIV specialists. Mothers should the make informed choices.

- 6) Health workers need to be updated about comprehensive management of HIV infected children in our environment. Respiratory infections should be detected and treated promptly and appropriately in HIV infected children as they account for the majority of deaths.

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**APPENDIX**

***STUDY INSTRUMENT***

Date of recruitment:...../...../..... Time..... Hours

Child's Full Name.....

Sex: M / F

Hospital No:..... Study

No:.....

Date of Birth:.....

Age.....D.....M..... Yrs.....

Mother's/Guardian's

Name.....Nationality.....

Address:

Residential.....

Postal :.....

Telephone No:.....

Since how long has the child lived at this address?.....

Patient current status: Inpatient/outpatient/New Adm./Ward:.....

Admission Ward:...../...../..... Time..... Hrs

Discharge/Death Date...../...../..... Time..... Hrs

Duration of Hospital stay.....Hrs.....Days.....

Is the child a referred patient? Yes/No/UK

if yes by:.....

**Informant: Mother/Other**

Specify:.....

Presenting Symptoms. (In Chronological Order)      Duration

- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
.....

Any treatment received for the above complaints before coming to the hospital?

Y/N/UK if yes, give details: .....

Type of treatment

From where?

And how long?

.....  
.....

Order of present hospitalisation:

.....

**PAST MEDICAL HISTORY**

History of blood transfusion Y/N

History of surgical procedures Y/N

History of traditional scarification Y/N

**SOCIO-ECONOMIC HISTORY**

Education status of mother: Primary/Secondary/College University/None.

Is the mother working? Y / N / UK family income per month

K.....

Type of employment: Regular/Casual/Farmer/Other,

Specify: .....

Mother's present marital status: Married/Single/Widow/Separated/Divorced

Housing: Own/Rented/Staying with

relatives/Others.....

How many rooms are there in the house?.....  
 How many people are living together in the house?.....  
 Source of drinking water: Own tap in the house/comm.  
 tap/others.....  
 Type of toilet: Own pit latrine/Flash  
 toilet/Others.....

General Examination

Weight..... Kg Height..... Cms Mid arm  
 circumference..... Cms

Temp:..... Pulse...../min Resp. rate/min

Hair: Normal/Depigmented Eyes: Normal/Xerosis

Ears: Normal/Purulent Discharge. Nose: Normal/Stuffy

Oral Cavity: Normal/Poor Hygiene/Whitish Patch.

Hydration: Normal/Dehydrated: Some/Severe

Mental States: Alert/Irritable/Lethargic/Unconscious

Lymphadenopathy: No/Yes, Neck/Axilla/Inguinal/Generalized

Oedema: Y/N feet Y/N Upper limb: Y/N Jaundice Y/N

Systemic Examination:

Abdomen: Liver: Not palpable/Enlarged..... Cmc

(PA) Spleen: Not palpable/Enlarged..... Cms

RS: Added sounds: Present/Absent/Do not know

CVS: Heart murmurs: Present/Absent/Do not know

CNS: Normal/Abnormal/Neck Stiffness: Y / N / Do not know

Musculoskeletal System: Normal/Abnormal

Specify any abnormal findings:

.....

## CLINICAL DIAGNOSIS

Working diagnosis.....

## INVESTIGATIONS.

MP slide positive/negative.

Hemoglobin level.....

White cell count---Total.....

Diferencial.....

HIV-1 test positive/negative.