PHARMACOECONOMIC ANALYSIS OF HIV/AIDS MANAGEMENT AT MURTALA MUHAMMAD SPECIALIST HOSPITAL, KANO, NIGERIA

By

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DECLARATION

I declare that the work reported in the thesis entitled Pharmacoeconomic Analysis of HIV/AIDS Management at Murtala Muhammad Specialist Hospital, Kano, Nigeria has been carried out by me in the Department of Pharmacology and Therapeutics, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any university.

_____	_____	_____
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CERTIFICATION

This thesis entitled PHARMACOECONOMIC ANALYSIS OF HIV/AIDS MANAGEMENT AT MURTALA MUHAMMAD SPECIALIST HOSPITAL, KANO, NIGERIA, by Fatima ManzumaAbdulrahman meets the regulations governing the award of the degree of Master of Science in Pharmacology of the Ahmadu Bello University, and is approved for its contribution to knowledge and literacy presentation.

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ABSTRACT

The HIV/AIDS pandemic has resulted in mortality surge and life expectancy drop throughout the world. Developing countries are mostly affected due to their limited health care system and resources to handle the increasing costs of management of HIV/AIDS and associated opportunistic infections. The objective of this study is to estimate direct and indirect costs of managing HIV/AIDS to both the health sector and the patients, at Murtala Muhammad Specialist Hospital, Kano (MMSH).

Patients' data from a sample of 256 adults and 28 children were collected between 1st January and 31st December 2010. The study revealed that majority of the patients were aged between 15 and 49 (87.7%), female (66.2%) and married (71.48%), while about forty percent were unemployed (39.8%) and 27.1% had an income of less ₦20,000. The average annual income for the patients was estimated to be ₦143,796. About half of the respondents had a CD4 count test done once (52.5%), most were on antiretrovirals (94.37%), a few had co-morbid illnesses (12.32%), side effects/adverse drug reactions (10.9%), hospitalized (11.27%) or had National Health Insurance Scheme (NHIS) coverage(3.87%).

The estimated average total annual costs to the health sector and patients were ₦323,303 and ₦10,516 respectively. Major contributors to health sector costs which were all direct-medical costs were antiretroviral drugs (83.60%) and health care personnel (12.37%).

Direct-medical costs to patients amounted to about ₦3,055 (2.12%) with major contributions from hospitalisation , treatment of co-morbid illnesses and laboratory tests.

Direct non-medical and indirect costs to patients were derived from transport (₦2,634, 1.83%) and productivity loss (₦4,827; 3.36%) respectively, the total patients cost of ₦10,516 amounted to 7.31% of their average annual income of ₦143,796.

Thus, data obtained suggested that the management of HIV/AIDS at MMSH poses a serious economic burden on the health care system and on patients living with the disease. Majority of the health care costs (antiretrovirals) were provided by Non Governmental Organisations (NGOs); this scenario applies all over the country. In the event that the NGOs withdraw their aid in the future, the burden to the health sector may be too much for the Government to bear. The expansion of the NHIS to include HIV/AIDS management will decrease the burden on the Government and the patients. Increasing efforts on HIV infection prevention should also significantly decrease the burden of HIV/AIDS in the long run.

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ABBREVIATIONS

3TC	LAMIVUDINE
AART	ADULT ANTI RETROVIRAL THERAPY
ADR	ADVERSE DRUG REACTIONS
AFB	ACID FAST BACILLI
AIDS	ACQUIRED IMMUNE DEFICIENCY VIRUS
ALT (SGPT)	ALANINE AMINOTRANSFERASE (SERUM GLUTAMC PYRUVIC TRANSAMINASE)
ARC	AIDS RELATED COMPLEX
ART	ANTI RETROVIRAL THERAPY
AVERT	AIDS VIRUS EDUCATION AND RESEARCH TRUST
AST (SGOT)	ASPARTATE AMINOTRANSFERASE(SERUM GLUTAMC OXALOACETIC TRANSAMINASE)
AZT	AZIDOTHYMIDINE
CASCADE	CONCERTED ACTION ON SERO-CONVERSION TO AIDS AND DEATH IN EUROPE
CD4	CLUSTER OF DIFFERENTIA 4
CDC	CENTER FOR DISEASE CONTROL
CNS	CENTRAL NERVOUS SYSTEM
COI	COST-OF-ILLNESS
CTX	COTRIMOXAZOLE
D4T	STAVUDINE
EFV	EFAVIRENZ
ESR	ERYTHROCYTE SEDIMENTATION RATE
FBC	FULL BLOOD COUNT
FBS	FASTING BLOOD SUGAR

FCC	FAMILY CARE CENTRE
FCT	FEDERAL CAPITAL TERRITORY (ABUJA)
FDA	UNITED STATES FOOD AND DRUG ADMINISTRATION
HAART	HIGHLY ACTIVE ANTI RETROVIRAL TREATMENT
HCW	HEALTH CARE WORKERS
HDL	HIGH DENSITY LIPOPROTEIN
HERFON	HEALTH REFORM FOUNDATION OF NIGERIA
HIV	HUMAN IMMUNODEFICIENCY VIRUS
HR	HUMAN RIGHTS CAMPAIGN
HTN	HYPERTENSION
KFC	KAISER FAMILYFOUNDATION
LDL	LOW DENSITY LIPOPROTEIN
MDG	MILLENNIUM DEVELOPMENT GOALS
MMSH	MURTALA MUHAMMAD SPECIALIST HOSPITAL
MP	MALARIA PARASITE
NACA	NATIONAL AGENCY FOR THE CONTROL OF AIDS
NGO	NON-GOVERNMENTAL ORGANISATION
NHIS	NATIONAL HEALTH INSURANCE SCHEME
NURTW	NATIONAL UNION OF ROAD TRANSPORT WORKERS
NVP	NEVIRAPINE
OIS	OPPORTUNISTIC INFECTIONS
OTC	OVER THE COUNTER DRUGS
PCM	PARACETAMOL
PCP	PNEUMOCYSTIC CARINII PNEUMONIA
PCV	PACKED CELL VOLUME

PEPFAR	PRESIDENTS EMERGENCY PLAN FOR AIDS RELIEF
PLWHA	PEOPLE LIVING WITH HIV/AIDS
PMTCT	PREVENTION OF MOTHER TO CHILD TRANSMISSION
PT	PREGNANCY TEST
PUD	PEPTIC ULCER DISEASE
SACA	STATE AGENCY FOR THE CONTROL OF AIDS
SE	SIDE EFFECTS
STD	SEXUALLY TRANSMITTED DISEASES
TB	TUBERCULOSIS
UNAIDS	JOINT UNITED NATIONS PROGRAMME ON HIV/AIDS
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNICEF	UNITED NATIONS CHILDRENS' FUND
US	UNITED STATES
VCT	VOLUNTARY COUNSELING AND TESTING
WBC	WHITE BLOOD COUNT
WHO	WORLD HEALTH ORGANISATION

CHAPTER ONE

INTRODUCTION

1.1 About the study

Ill-health can result in an increase in economic burden on individuals, contributing to income loss, asset depletion as well as investment of a large amount of National resources to combating that disease. These processes are brought into sharper focus by the social and economic impact of the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) epidemic. Concern about the links between ill-health and impoverishment has placed health at the centre of development agencies' poverty reduction targets and strategies. This has strengthened arguments for a substantial increase in health sector investment to improve access for the world's poorest people to combat poverty as well as reduce disease burden (Russel, 2004). This thesis reports on an evaluation of costs committed to HIV/AIDS management in a secondary health facility, (MMSH) in Kano, Nigeria.

1.2 Statement of Research Problem

The HIV/AIDS pandemic constitutes one of the greatest health challenges of our time (IBBSS, 2008) and its impact cannot be overemphasized. HIV has added to the burden of the already over-stretched health care infrastructure in Nigeria as well as increased the number of orphans and other vulnerable children, placing additional strain on family and community support structures (FMOH, 2008).

With the growth rate (2%) and burden of illness, it is important for us to know the impact of HIV/AIDS management on health systems, individuals and societies as well as a description and analysis - a measure of the cost of illness (COI), which is a major tool in pharmacoeconomics. According to CDC (2009), COI is defined as the value of

the resources that are expended or foregone as a result of a health problem. The COI includes health sector costs, the value of lost productivity by the patient (indirect cost), and the cost of pain and suffering (intangible costs) (CDC, 2009).

HIV infection is a major public health problem in all parts of the world. For the United States, federal spending on HIV disease for 1982 to 1989 was $US5.5 billion. Projections indicate that AIDS spending may reach 1.6% of total health expenditures in 1992, while the indirect costs of HIV infection may be 5 times as great as the direct costs (Lynn *et al*., 1992). The reported official development assistance for HIV to Nigeria between 2001 and 2008 is $US989.14 million (NASA, 2008). In the developing countries, the cost per person with HIV infection may be 0.8 to 9-fold greater than the per capita gross national product (GNP), this would confer some burden to the economy.

1.3 Justification for the Study

Poverty, an issue in Sub-Saharan Africa, exacerbates the impact of HIV and AIDS. Food insecurity also weakens the beneficial effects of medicine, while caring for the sick and those orphaned or widowed by AIDS stretches families' resources to their limits. HIV/AIDS continues to devastate the African region, which has 11% of the world's population, but 60% of the people with HIV/AIDS. Although HIV/AIDS remains the leading cause of death for adults, more and more people are receiving life-saving treatment. The number of HIV-positive people on antiretroviral medicines increased eight-fold, from 100 000 in December 2003 to 810 000 in December 2005 (WHO, 2009). These epidemiological data help determine a nation’s current health profile and systems and also identify the effectiveness of available technologies in eliminating these problems.

The African Regional Health Report (2009), stresses that Africa can move forward on recent progress only by strengthening its fragile health systems. To achieve this, it would need to make informed choices on which health problems to address and what interventions to use to alleviate them hence, knowledge of the economic burdens of the various health problems is important. A major drawback to carrying out these evaluations in Africa is the already limited resources to the health sector.

1.4 Theoretical Framework

The compilation of COI estimates for HIV/AIDS management can be challenging and complex, however, the framework for the study is adapted from previously carried out studies. The design and performance of these studies need to be built around a set of objectives and standards that have scientific validity and can be communicated to the concerned scientific community, policy makers and the general population. The framework as outlined by Segel (2006) includes the following:

Estimate costs which include:

I. Direct-medical costs which include cost of drugs, hospitalization, emergency visits, managing co-morbid illnesses, side effects/adverse drug reactions
II. Direct non-medical costs which include transport and
III. Indirect costs which include productivity losses (Segel, 2006; Mauch, 2008).

Individuals suffering from HIV/AIDS cuts across all ages but most of them are often in their economically most productive age, this poses a significant economic burden on the household and community as well as on the health workers if the number is significant as well as if health workers are affected by the illness. This study is in a hospital mostly accessed by non affluent individuals hence the costs as a percentage of

their income may be higher than for non-poor patients. Out-of-pocket costs for public and private health-care services may also exacerbate burden on the already non-financially buoyant people. Stratification of patients along several indicators (gender, geography, socioeconomic status) is therefore necessary (Mauch, 2008).
Accomplishing these steps can require significant time, resources, and skill, but keeping these objectives and questions in mind during the course of the study should facilitate the effort and ultimately make the final estimate more accurate.

1.5 Aim and Objective of the Study

1.5.1 *Aim of the study*

The aim of this study is to determine the economic burden of management of HIV/AIDS patients at the Murtala Mohammed Specialist Hospital Kano, Nigeria.

1.5.2 *Specific Objectives of the Study*

I. To determine the direct and indirect components of COI of HIV/AIDS on the health care sector
II. To determine the direct and indirect components of the COI of HIV/AIDS of patients.

1.6 Statement of Research Hypothesis

Management of HIV/AIDS at the Murtala Mohammed Specialist Hospital, Kano, Nigeria has no economic burden on the health care system and on the patients.

CHAPTER TWO

LITRATURE REVIEW

2.1 Overview of HIV/AIDS

HIV is a retrovirus that infects cells of the immune system, destroying or impairing their functions (WHO, 2008). HIV has a high affinity for the cluster of differentia 4 (CD4) receptor on T lymphocytes and its major effect on the immune system is a progressive depletion of CD4 T lymphocytes (Martindale, 2008). Thus, infection is followed by development of anti-HIV antibodies known as seroconversion, during which the patient may remain asymptomatic or have transient symptoms such as rash, sore throat, and lymphadenopathy (Martindale, 2008). Despite the presence of the anti-HIV antibodies, the infection progresses over a period of months to several years ultimately resulting to a persistent generalized lymphadenopathy (lymphadenopathy syndrome) or a more serious collection of symptoms known as AIDS-related complex (ARC), which include fatigue, weight loss, recurrent fever, diarrhoea, and persistent opportunistic infections (Martindale, 2008). AIDS is characterised by severe impairment of the immune system leading to the development of secondary infections - opportunistic infections (OIs) which could be life-threatening and include *Pneumocystis carinii* pneumonia (PCP), *Toxoplasma* encephalitis, oropharyngeal and oesophageal candidiasis, cryptococcal meningitis, cytomegalovirus retinitis, and tuberculosis (TB), or to secondary neoplasms such as Kaposi's sarcoma, primary central nervous system (CNS) lymphomas, invasive cervical cancer, and non-Hodgkin's lymphoma. Other complications may include dementia and thrombocytopenia (Martindale, 2008).

Two subtypes of HIV have been found - HIV-1, which is the most common and occurs worldwide and HIV-2, which is found mainly in Africa and is associated with a slower progression to AIDS than HIV-1 (Reeves *et al*., 2002). Thus, most untreated people infected with HIV-1 eventually develop AIDS. These individuals mostly die from OIs or malignancies associated with the progressive failure of the immune system. HIV progresses to AIDS at a variable rate influenced by the viral, host, and environmental factors; most will progress to AIDS within 10 years of HIV infection: some will have progressed much sooner, and some will take much longer (CASCADE EU, 2000). Treatment with antiretrovirals (ARVs) increases the life expectancy of people infected with HIV. Even after HIV has progressed to diagnosable AIDS, the average survival time with antiretroviral therapy (ART) was estimated to be more than 5 years as of 2005 (Schneider *et al*., 2005). Without ART, someone who has AIDS typically dies within a year (Morgan *et al*., 2002).

OIs, which may be caused by bacteria, virus, fungi or protozoa, are the major cause of morbidity and mortality in patients with HIV-1 infection. HIV/AIDS patients are especially susceptible to OIs because of their suppressed immune system, psychological stress which in turn can influence the immune system and depletion of nutritional status (Benson *et al*., 2009). OIs are sometimes the initial presentation of HIV disease and affected patients may have ignored the warning signs, attribute it to other illnesses or may just not have wanted a voluntary counselling and testing (VCT). Often, OIs may be the first signs of immunologic deterioration and tend to occur as CD4 counts drop though children < 1 year of age may get OIs with “normal” CD4 counts (Benson *et al*., 2009).

The use of ART has reduced the incidence of OIs for patients with access to HIV care, however a number of patients in the developed and developing world do not have access to care and have OIs. Also, others who do not have a sustained response to ARV agents for multiple reasons which include poor adherence, drug toxicities, drug interactions, or initial acquisition of a drug-resistant strain of HIV-1 will have OIs. Thus, OIs will continue to cause substantial morbidity and mortality in HIV/AIDS patients especially in those with HIV-1 infection (Benson *et al*., 2009).

Thus, initiation of ART prevents OIs as well as help in resolution or improvement of certain OIs, most notably for those where specific treatment is not available. At times, patients who receive potent ART can have atypical presentations of OIs either early after the initiation of ART or after prolonged treatment (Benson *et al*., 2004).

OIs range from mild infections; particularly of skin and mucosal surfaces (examples include skin rashes and oral thrush) to severe life threatening infections like TB, cryptococcal meningitis, oesophageal candidiasis and PCP (Benson *et al*., 2004; CASCADE EU, 2000).

2.1.1 *HIV/AIDS Timeline*

The first recorded evidence of HIV has now been traced back to 1959. A team of British researchers stumbled on this evidence while working with preserved tissue samples of a Manchester sailor who died in 1959 of a disease that presented AIDS-like symptoms (Pence, 2008; Zhu *et al*., 1998). AIDS was first described in 1981 as a disease complex in heterosexual men in the United States of America. The journey HIV/AIDS have gone through can be outlined below:

In 1980, though an unknown disease at the time 31 people had died in the United States (US) of what would be known in later years as AIDS.

In 1981, the Centres' for Disease Control (CDC) published the first account of peculiar deaths from a syndrome that would later be named AIDS. The outbreak began when a rare cancer Kaposi's sarcoma and a rare pneumonia, PCP was noticed among otherwise healthy gay men in San Francisco. A total of 335 cases were diagnosed in the US and 158 died.

By 1982, 1,580 cases had been diagnosed in the US with 603 deaths. By 1983, 4,788 cases had been diagnosed in the US with 2,173 deaths. In that year the CDC warned blood banks of the possible contamination of the blood supply with HIV. It was also discovered that children could acquire the disease from their mother's womb. Outbreaks began to appear in Britain, France, Australia and Africa, altogether a total of 33 countries had reported cases of the disease.

By 1984, 11,148 cases had been diagnosed in the US with 5,655 deaths. The deaths included a flight attendant "patient zero", the patient purported to have brought AIDS to North America.

By 1985, 23,174 cases had been diagnosed in the US with 12,652 deaths. The first international conference on AIDS was held in Atlanta; it was sponsored by World Health Organization (WHO) and attended by about 2,000 people from 26 countries. By now, the cases had been reported in 51 countries, at least one case in every region of the world. An estimated 1.5 million people were living with HIV.

By 1986, 42,546 cases had been diagnosed in the US with 24,806 deaths. The word HIV was coined for the virus responsible for AIDS.

By 1987, 71,616 cases had been diagnosed in the US with 41,262 deaths. WHO estimated that about 150,000 cases may exist worldwide and also launched a global programme on AIDS. Azidothymidine, AZT becomes the first anti-HIV drug to be approved by the United States Food and Drug Administration (FDA). In this year, the US Government acknowledged the HIV/AIDS scourge and created an AIDS advisory panel.

By 1990, 200,525 cases had been diagnosed in the US with 121,952 deaths. In this year, at least 8 new drugs had been approved by the FDA. Also, about 9 million people were estimated to be infected with HIV and about 1 million with AIDS worldwide.

By 1992, 339,527 cases had been diagnosed in the US with 199,567 deaths. Use of combination regimen began and signs of successes were seen compared with earlier drugs which when used alone were effective for an average of a year after onset of AIDS.

By 1996, 620,767 cases had been diagnosed in the US with 381, 437 deaths. A survey showed the marked improvement in public awareness of the epidemic. Female condom was also approved but not for anal sex on the grounds of sodomy being illegal. It was reported that AIDS was the leading cause of death in young adults between the ages of 25 and 44. AZT was seen to reduce mother-to-child transmission of HIV by two thirds. In this period the "AIDS cocktail" was borne. The WHO-AIDS programme was replaced by the United Nations Joint Programme on AIDS (UNAIDS). The incidence of the epidemic dropped by 6% and death by 25% and new infections remained steady at 40,000 per year (HRC, 2006).

By 1997, AIDS deaths began to decline in developed countries, due to the ARVs. Brazil began providing free ARVs making it the first developing country to do that as compared to others where only a tiny minority could access treatment for HIV. Around 22 million people are living with HIV worldwide, according to estimates made later.

By the year 2000, UNAIDS, WHO and other global health groups announced an initiative with five major drug makers to negotiate lower prices for AIDS drugs in developing countries. UNAIDS, estimates that more than 27 million people around the world were living with HIV.

President Thabo Mbeki of South Africa voiced support for AIDS dissidents following a 2009 report that an estimated 5.6 million people in South Africa were living with HIV/AIDS with 310,000 deaths from AIDS (more than any other country). Prevalence was 17.8 percent among those aged 15-49. Also, almost one-in-three women aged 25-29, and over a quarter of men aged 30-34 were living with HIV. Programmes were also put in place with the aim of reducing HIV incidence by 50% in 2011.

By 2002, world leaders had set long-term targets on HIV/AIDS; the global fund was established to boost the response to AIDS, TB and malaria. Drug companies agreed to reduce prices of generic AIDS drugs in developing countries. HIV became the leading cause of death worldwide for those aged 15 to 59. Also, 50% of adults living with HIV were women. Botswana began providing ARVs making it the first nation in Africa to have its national AIDS treatment programme.

By 2003, HIV/AIDS drugs had become more affordable for developing countries. The "3 by 5" campaign (involves providing ARVs to 3 million people by 2005) was

launched to widen access to AIDS treatment. The first AIDS vaccine major trial was undertaken and it was found to be ineffective.

By 2005, America launched a major initiative called President's Emergency Plan for AIDS Relief (PEPFAR) to combat AIDS worldwide. After much hesitancy South Africa began to provide free ART.

By 2006, circumcision had been shown to reduce HIV infection among heterosexual men. Only 28% of people in developing countries who needed treatment for HIV were receiving it. Annual Global spending on AIDS in low- and middle-income countries was $8.9 billion while an estimate showed that $14.9 billion would be needed for a truly effective response.

By 2007, an estimated 33 million people were living with HIV worldwide. Another major HIV vaccine trial is halted after preliminary results showed no benefit.

By 2008, a controversial Swiss study claimed that people adhering to ARVs have a "negligibly small" risk of transmitting HIV through unprotected sex. PEPFAR is reauthorized, committing $48 billion for the next five years.

By 2009, about 4 million of the 9.5 million people in immediate need of ART in developing and transitional countries were receiving treatment. The President of US announced the removal of the travel ban that prevents HIV-positive people from entering the US. Researchers found a new strain of HIV-1 that originated with gorillas in a Cameroonian woman (AVERT, 2009; Zafar, 2010).

2.1.2 *Method of Transmission of HIV/AIDS*

HIV infects the cells of a living organism and it is found in blood and other body fluids. The virus cannot live for long outside the body consequently; the body fluid from an infected person has to come in contact with another person's body fluid to complete the process of transmission. The routes through which HIV can thus be transferred include;

- Sexual contact
- Exposure to infected blood or blood products
- Perinatally from an infected mother to her baby.

Though the virus has been isolated from blood, semen, vaginal secretions, breast milk, saliva, tears, Cerebrospinal fluid, amniotic fluid and urine, evidence has shown that transmission occur in the first four, in urine and amniotic fluid only when it contains visible blood and with saliva only when large volumes are exchanged (Kennedy *et al*., 2009).

Two methods of transmission occur: horizontal and vertical.

Horizontal Transmission: the virus is transmitted from one person to another (direct contact). It could be through

- Unprotected sexual intercourse (vaginal, anal, and oral) with an HIV infected person. Studies have shown that the receptive partner in intercourse has a greater chance of acquiring HIV than the insertive partner. Other factors associated with an increased risk of HIV infection are exposure to blood such as genital ulcer disease, trauma during sex, menstruation of the HIV infected

woman and exposure to inflammation of the genital or rectal mucosa which can occur with sexually transmitted infections (STIs).

- Sharing of drug needles or syringes with an HIV-infected person: a study has shown this to have an approximate risk of 0.67% per exposure.

- Contamination of mucous membranes or break in the skin: This is mostly suffered by health worker when they are in contact with infected individuals. As reported by Russel *et al*. (2004), a study has shown that the overall risk of HIV infection after percutaneous exposure to infected blood is 0.3% and after mucous membrane exposure is 0.09%.

Vertical Transmission: this is usually between a mother and her infant and occurs at various stages during the perinatal period;

- During ante partum/pregnancy: this mostly occurs through the placenta. It may occur after placental disruption as in placental abruption or during amniosynthesis.
- During intrapartum/Childbirth: this may result from maternal-foetal transfusion of blood during labour and through contact of the foetus with infected blood or other maternal secretions during the delivery.
- During postpartum/breastfeeding: this may occur by inoculation if the infant is injected before the mothers' secretions are removed from the body or through breastfeeding because of prolonged exposure of the infants oral or gastrointestinal tract to infected breast milk.

2.1.3 *Impact of HIV/AIDS*

Over the past 25 years, nearly 25 million people have died from AIDS. HIV/AIDS has caused debilitating illness and premature death in people during their prime years of life and has devastated families and communities. It has complicated efforts to fight poverty, improve health, and promote development especially in the developing countries which are most affected by the epidemic.

HIV/AIDS diminishes a person's ability to support, work and provide for his or her family. Also the treatment and health-care costs related to HIV/AIDS consume household incomes in developed countries as well as in developing countries. Though the anti-retroviral drugs may be "free" in developing countries, the overall costs as a result of OIs are more than a number of infected individuals can contend with. The combined effect of reduced income and increased costs impoverishes individuals and households.

HIV/AIDS deepens socioeconomic and gender disparities. Women are at high risk of infection and have few options for providing for their families. Children affected by HIV/AIDS, due to their own infection or parental illness or death, are less likely to receive an education, as they leave school to care for ailing parents and younger siblings or lose their educational sponsors. The impact of HIV/AIDS on women and girls has been particularly devastating given the epidemiologic data. And this cannot be overemphasized. The children represent a generation and their loss would present with a myriad of economic problems; the women are equally as important.

HIV/AIDS has also strained the resources of communities; hospitals, schools and businesses. A number of health care workers, teachers, and business and government leaders have been lost to HIV/AIDS (WHO, 2009).

The impact on health care cannot be overemphasized because on one hand AIDS is causing an increased demand for health services and on the other hand, a large number of healthcare professionals are being directly affected by the epidemic, added to the drain of health care workers to richer countries with better pay and better work hours and condition (WHO, 2009). The UNAIDS 2006 report showed Botswana as having lost 17% of its healthcare workforce due to AIDS between 1999 and 2005 and a study in a region of Zambia found that 40% of midwives were HIV-positive. Increase in the provision of antiretroviral drugs though helping HIV infected people has also added to the strain on healthcare workers, since providing ARV treatment to everyone who needs it requires more time and training than is currently available in most countries.

The effect of HIV/AIDS on businesses is also crucial as HIV profoundly affects labour, thus setting back economic and social progress. This is most critical in developing countries-the vast majority of people living with HIV in Africa are between the ages of 15 and 49 - in the prime of their working lives. AIDS damages businesses by squeezing productivity, adding costs, diverting productive resources, and depleting skills. For businesses that offer costs for health-care, funeral benefits and pension fund business will be bad for them due to the to rise in number of people taking early retirement or dying. As a result of this, certain organisations do not employ those who are HIV positive. On a wider view, as the impact of the epidemic on households grows more severe, market demand for products and services (small scale businesses) can fall either from increased absenteeism from morbidity or as a result mortality. Comparative studies of East African businesses have shown that absenteeism can account for as much as 25-54% of company costs (UNAIDS and WHO, 2008). The impact of diminished productivity is felt on a national scale but much more devastating in developing countries as they account for 90 percent of people living with HIV.

A study in several Southern African countries has estimated that the combined impact of AIDS-related absenteeism, productivity declines, health-care expenditures, and recruitment and training expenses could cut profits by at least 6-8%. Another study of a thousand companies in Southern Africa found that 9% had suffered a significant negative impact due to AIDS. In areas that have been hit hardest by the epidemic, it is found that up to 40% of companies reported that HIV and AIDS were having a negative effect on profits (AVERT, 2009; UNAIDS, 2008).

Some companies have implemented successful programmes to deal with the epidemic. An example is the gold-mining industry in South Africa which attracts thousands of workers, often from poor and remote regions. Because they live in hostels, separated from their families with a thriving sex industry operating around the mine, the threat from HIV cannot be ignored hence companies work with a number of organisations to implement prevention programmes for the miners. These have included mass distribution of condoms, medical care and treatment for STDs, and awareness campaigns. Other mining companies have started to replace all-male hostels with accommodation for families, to combat transmission of HIV and other STDs (AVERT, 2009).

The same was done in Botswana, the Debswana Diamond Company offers all employees HIV testing, and provides ARV drugs to HIV positive workers and their spouses. This policy was introduced in 1999 when the company found that many of their workforces were HIV positive. With a skilled workforce, it is financially worth their while to protect the health and therefore the productivity of their workers. Nevertheless, workplace programmes for HIV treatment and prevention remain scarce in Africa (UNAIDS, 2008).

This practice has not been embraced in Nigeria, but with the National Health Insurance Scheme (NHIS) established by the Government of Nigeria and other non-governmental health policies; this may be a thing of the near future. NHIS came into light in Nigeria in 1999 under Decree 35. The idea was to replace the existing 'cash and carry' health-financing system which necessitates every health-seeking individual to pay money instantly before and after treatment in the hospitals and clinics across the country. The scheme went into effect in June 2005 but till date, needless deaths occur as the means of quality healthcare services is still far away from the reach of most Nigerians as millions are not aware that a health social security systems exist or because of the area of coverage of the scheme (it does not include ART).

HIV/AIDS has caught the attention of the world and as such has benefited from a varied form of intervention. This may account for the decreased global prevalence as well as rate of new HIV infections but unfortunately not the total number of people living with HIV as that continues to rise.

The sixth Millennium Development Goal (MDG) focuses on stopping and reversing the spread of HIV/AIDS by 2015. In the face of the present statistics, especially that of Africa, this may be a tall order as a lot of individuals are not aware of their status and as such are not taking measures to stop themselves from either getting infected or passing on the infection. For those that are aware, not all have access to ARVs. Also, people especially women in developing countries are faced with a number of challenges which contributes to battling the disease (UNAIDS and WHO, 2008).

2.1.4 *Factors Militating against Accessing ART and HIV Care*

1. Stigma: individuals are inclined to hide the sickness from their boss, spouse or partner, family and community because of the stigma associated with HIV/AIDS. This may keep them from seeking VCT or ART services out of fear of repercussions from disclosure, from peers, clients and co-workers.
2. Lack of resources and access to HIV/AIDS treatment and care: Many individuals in need of medication lack access to ARVs either because they live in rural or remote areas far from a health centre with no money for transportation or because they are not aware of their status.
3. Lack of power and control (women): In most developing countries men are the sole breadwinners in a household hence women are afraid of blame, physical abuse or abandonment after disclosing their infection to their husband or partner. The laws in many countries leave women without property or inheritance rights and these fears make women keep their status a secret, exposing themselves, their children and spouses to severe ill health by not accessing proper HIV/AIDS management and care.
4. Lack of other medications: HIV as mentioned earlier attacks the immune system as such infected individuals suffer a number of opportunistic and related infections, such as TB, malaria, Hepatitis C, pneumonia or cancer. Access to drugs for these may be difficult as they may not be available at local health centres. In patients opportune to have health insurance policies (example NHIS), the fragmented state of our health care system which does not reconcile patient medical history does not allow them fully to benefit from these policies.
5. Lack of access to nutrition and clean water: ARVs alone are not enough to combat ill health. The decline in immunity could benefit from a number of good

hygiene (food, personal and environmental) as such adequate nutrition is an integral complement to treatment. Famines, droughts, political events and loss of ability to farm (in cases of morbidity) may reduce supplies of food and clean water. Lack of access to these basic necessities is particularly harmful to pregnant women, children and those on ARV therapy. Generally, a proper diet reduces growth and developmental deficits among children and unwanted weight loss among adults. Clean water is essential for some paediatric formulations of ARVs.

6. Uncertainty of the future: People living with HIV may have to deal with delays in or diminished supplies of their ARVs, increasing the possibility of developing resistance to their drugs and the necessity for costly second-line drugs. Governments may lack the will and the resources to secure sustainable sources of ARVs and to build capacity for the provision of care and treatment. The issue of sustainability of programs especially health care programs has been a problem in developing countries. In order to tackle this, most care programs are integrated into existing health institutions. Doing that alone will not solve the problem as the institutions already have their finances stretched. Integrating it in health insurance programs would go a long way in providing quality health care to individuals with only immediate worry for food, utility and other basic necessities and not health.

2.1.5 *HIV Treatment in Nigeria*

The treatment method adopted for the management of HIV/AIDS in Nigeria is in line with the WHO guidelines for the diagnosis and treatment of HIV infection and related

disorders in resource-limited settings. The treatment is based on the CD4 count of the individuals.

In general, HIV infections eventually result in AIDS, which is invariably fatal. However, in a small proportion of patients the immune system stabilizes after an initial decline in CD4 count despite continued HIV infection. Cases of clearance of HIV infection in neonates infected prenatally have been reported. Variation in the genes for recently identified co-receptors necessary for HIV infection may be involved and may offer new therapeutic targets as is being explored (WHO *et al*., 2008).

Treatment strategies for HIV infection have been changing rapidly with the advent of new antiretroviral drugs and improved timing of treatment and guidelines for the treatment of HIV infection. There has been an ongoing debate as to whether to start treatment early in the course of the infection or to delay until the disease progresses.

The main drugs used in combination therapy are:

Nucleoside Reverse Transcriptase Inhibitors: zidovudine, abacavir, didanosine, lamivudine, stavudine, and zalcitabine.

HIV-Protease Inhibitors: amprenavir, atazanavir, fosamprenavir, indinavir, lopinavir, nelfinavir, ritonavir, and saquinavir.

Non-nucleoside Reverse Transcriptase Inhibitors: delavirdine, efavirenz, and nevirapine).

The Fusion Inhibitor, enfuvirtide may herald a new class of drugs and acts by blocking fusion of HIV with cells, thereby blocking entry (WHO, 2010).

Combination therapy is the mainstay in ART with the ARVs given early in the infection to improve efficacy, minimise toxicity, and delay drug resistance. Usually, combinations of three ARVs, typically two nucleoside reverse transcriptase inhibitors plus either an HIV-protease inhibitor or a non-nucleoside reverse transcriptase inhibitor, referred to as highly active antiretroviral therapy (HAART), have produced reductions in viral loads, often to levels below the limits of detection, and have been associated with sustained improvements in disease progression (WHO, 2010). It appears that it is necessary to suppress viral replication to this extent in order to inhibit the emergence of resistant variants and consequent disease progression. Decline in CD4 count has been arrested or reversed in patients on HAART, even in the absence of profound suppression of viraemia, and there is also some evidence that immune function may be partially restored in the long term (CDC, 2008). Declining morbidity and mortality among patients with HIV infection have been attributed to the introduction of these effective treatment regimens. Systematic review and meta-analysis has concluded that triple therapy regimens are superior to dual therapy or mono-therapy which was the initial ARV treatment strategy. Quadruple therapy regimen has also been of benefit (CDC, 2008 and WHO, 2010).

HAART regimens have been shown to be more effective in antiretroviral-naive patients, than those who have received previous treatment. When a new regimen is started, drugs should be started simultaneously rather than sequentially. But when drug regimen are being changed it should be entirely to drugs that have not been taken previously, or at least two of a triple-drug regimen should be changed this is not always achieved though. Also, discontinuation of HAART regimens in the face of undetectable viral level has shown that there is usually a rapid return to pre-treatment levels once treatment is stopped. The continued effectiveness of any HAART regimen is dependent

on compliance with treatment, since lapses in compliance can rapidly lead to the emergence of HIV variants resistant to one or more of the drugs being used and consequent disease progression (WHO *et al*., 2008). However, compliance is difficult to maintain due to the complexity of many regimens and to poor tolerability and long-term adverse effects of the drugs used. To promote compliance as a result of pill burden, fixed dose formulations have evolved in most cases combining the three regimens or two.

ARVs were introduced to Nigeria in the early 1990s (Gwarzo, 1998). During this period, it was expensive and only a few people representing a minority of those infected could afford them. The Nigerian government in 2002 started an ambitious ART programme (worth about $3.5 million), which aimed to supply 10,000 adults and 5,000 children with antiretroviral drugs within one year. The drugs were to be procured and given to patients at a very subsidized rate. The programme was announced as 'Africa's largest ARV treatment program (Gwarzo, 1998).

By 2004 a major setback had occurred because new infections were being reported with no increase in drug supply. Thus, people had to be put on a waiting list to enrol into care and others already enrolled had to wait up to about three months to receive their drugs. This resulted in possible reverse in progress the drugs have already made and also increasing the risk of resistance. Eventually, more money (about $3.8 million) was put into the programme (Gwarzo, 2006; WHO, 2010).

In 2006 there was a scale up from 25 to 66 (additional 41) treatment centres' which were issuing free ARVs to HIV/AIDS patients. Treatment scale-up between years 2006 and 2007 was impressive, rising from 81,000 people (15% of those in need) to

198,000 (26%). Despite this progress, universal access to AIDS treatment is still a long way off (WHO *et al*., 2008).

2.1.6 *Funding for HIV/AIDS*

It has been estimated that the Nigerian government are contributing about 5% of the funds for the ART programmes. The majority of the funding comes from development partners. The main donors are PEPFAR, the Global Fund and the World Bank (HERFON, 2007).

In 2002, the World Bank loaned $90.3 million to Nigeria to support the 5-year HIV/AIDS programmes development project. In May 2007, it was announced that the World Bank were to allocate a further $50 million loan (HERFON, 2007).

In 2008 PEPFAR provided approximately $448 million to Nigeria for HIV/AIDS prevention, treatment and care, this was said to be the third highest amount out of PEPFAR's 15 focus countries.

In August 2012, Global Fund approved $360,454.93 and disbursed $275,586.635 in funds to Nigeria to expand HIV/AIDS treatment, prevention and care programmes. Most recent funding is focused on decentralising HIV prevention, support and care and to make it available in primary care facility and at the community level to improve gender sensitive prevention interventions and expand ART access across secondary facilities (AVERT, 2012).

Global funding is increasing, but global need is growing even faster – widening the funding gap. Services and funding are disproportionately available in developed countries (AVERT, 2012).

The Nigerian government at the federal level will have to increase its political will to support the HIV/AIDS course by a significant increase in budgetary allocation for ARVs. Most states and local governments do not have the will at all and this is where most of the HIV responses take place. The heavy dependence on donors for the programme does not augur well for sustainability (HERFON, 2007).

Thus, National Agency for the Control of AIDS (NACA) and State Agency for the Control of AIDS (SACA) need to come up with a plan for financial sustainability for effective response with visible contributions from the states. This is currently lacking as only a few states (Anambra, Cross River, Plateau, Benue, Lagos and Abuja) have some programme on HIV/AIDS. This is because whereas there is a moral imperative for powerful nations to support weaker ones with development aids; by virtue of belonging to a global community, when such aids becomes the main driving force and not supplementary to locally contrived and driven effort, it forms the basis for poor ownership, sustainability and inevitable collapse (HERFON, 2007).

The economic meltdown (2007-2010) which is considered by many economists (business wire news (2009) to be the worst financial crisis since the great depression of the 1930s may have a negative effect in terms of funding in the long run as the US is one of the donors (PEPFAR). The melt down was triggered by a liquidity shortfall in the United States banking system, and has resulted in the collapse of large financial institutions, the bailout of banks by national governments, and downturns in stock markets around the world, many areas including the housing market has also suffered, It has also contributed to the failure of key businesses, declines in consumer wealth estimated in the trillions of U.S. dollars, substantial financial commitments incurred by governments, and a significant decline in economic activity. Both market-based and

regulatory solutions have been implemented or are under consideration but significant risks remain for the world economy over the 2010–2011 periods (Roubini, 2010). The year 2010 which media has dubbed the year of natural disasters (storms and droughts in China; floods and mudslides in Brazil, China, Nigeria and central Europe, tornadoes and hurricanes in the US, earthquakes in Haiti, Chile, Iran, Canada; wildfires in Russia and Brazil) may also not bode well for the HIV/AIDS programme. The disasters have been in both developed and developing countries and the cost of relief materials and estimates for rebuilding have been staggering (James, 2009).

2.2 Epidemiology of HIV/AIDS

2.2.1 *Global Epidemiology of HIV/AIDS*

The response to HIV is important to the progress in the global development agenda as addressing HIV will accelerate progress in achieving most of the Millennium Development Goals. Satisfying the many political commitments made on HIV will require greater leadership, building on recent successes by taking account of lessons learnt, enhanced financial resources, improved coordination of effort, and effective action to address societal determinants of HIV risk and vulnerability.

Globally, the number of people living with HIV has stabilized since 2000. However, the overall number of people living with HIV has increased; this is as a result of the ongoing number of new infections each year and the beneficial effects of more widely available ART.

UNAIDS (2010) reported that;

In 2009, there were 2.6 million new infections, down from 3.1 million in 1999.

In 2009 there were 1.8 million AIDS-related deaths, lower than the 2.1 million in 2004. In 2009, some 33.3 million people were living with HIV compared to 26.2 million in 1999.

In 2009, around 370,000 children were born with HIV, bringing to 2.5 million the total number of children under 15 living with HIV.

Since the beginning of the epidemic, more than 60 million people have been infected with HIV and nearly 30 million people have died of HIV-related causes.

Globally, the annual number of new HIV infections declined by nearly 20% in the past 10 years. Among people in the 15 of the most severely affected countries, HIV prevalence has fallen by more than 25% as young people adopt safer sexual practices.

Also, percentage of HIV pregnant women who received PMTCT increased from 35% in 2007 to 53% in 2009. There are also two new HIV infections for every one person starting HIV treatment (UNAIDS, 2010). The percentage of women among people living with HIV has also remained stable at 50% for several years. However, women's share of infections is increasing in several countries.

As regards treatment, it was reported that in 2009, 5.2 million people in low- and middle-income countries had access to antiretroviral treatment, up from 700,000 in 2004.

In 2009 also, 700,000 people received antiretroviral treatment in high-income countries.

There are 10 million people still in need of treatment who do not have access (UNAIDS, 2010).

2.2.2 *Epidemiology, Africa*

Sub-Saharan Africa continues to bear a disproportionate share of the global HIV burden. An estimated 22.5 million people living with HIV resided in sub- Saharan Africa in 2009, representing 68% of the global HIV burden.

About 34% of all people living with HIV resided in the 10 countries of southern Africa in 2009. With an estimated 5.6 million HIV-positive people, South Africa continues to have the world's largest HIV epidemic.

Swaziland has the highest adult HIV prevalence in the world: an estimated 25.9% [24.9%–27.0%] of people in the country were living with HIV in 2009.

Infections in this region are declining or stable. Among the five countries in sub-Saharan Africa with the largest HIV epidemics, four—Ethiopia, South Africa, Zambia and Zimbabwe—reduced new HIV infections by more than 25% between 2001 and 2009, while Nigeria's HIV epidemic stabilized.

National HIV prevalence in Kenya fell from about 14% in the mid-1990s to 5% in 2006. Since 2001, HIV prevalence in Uganda has stabilized between 6.5% and 7%. In Rwanda, HIV prevalence has been approximately 3% since 2005.

HIV prevalence in West and Central Africa remained relatively low in 2009, at or under 2% in 12 countries.

AIDS related deaths in the region are declining due to the wide coverage of ART. In 2009, nearly 37% of adults and children who were medically eligible for ART received it, compared to just 2% seven years earlier. Treatment scale-up is saving lives: between 2004 and 2009, AIDS-related deaths decreased by 20% in sub-Saharan Africa.

Women remain disproportionately impacted by HIV. The vulnerability of women and girls to HIV remains particularly high in sub-Saharan Africa; about 76% of all HIV-positive women in the world live in this region and most aged 15-24. In South Africa, HIV prevalence among women aged 20-24 is approximately 21%, compared to about 7% among men in the same age range. The most recent prevalence data show that 13 women in sub-Saharan Africa become infected with HIV for every 10 men (UNAIDS, 2010).

2.2.3 *Epidemiology, Nigeria*

Nigeria has a population of approximately 162.5 million people. An estimated 3.3 million people live with HIV/AIDS, and 222,000 died from AIDS related illnesses in 2009.

PMTCT services have increased from 5.3% in 2007 to 22% in 2009. Coverage for children is still low, only 8% received ARVs for PMTCT.

By 2010 ARV treatment coverage remained seriously low, with only a quarter of adults and 7% of children in need of treatment receiving it. Currently 1.4 million adults and 262,000 children eligible for ARV treatment remain without it.

HIV epidemic in Nigeria has gone from affecting only a few populations with higher-risk behaviours ('concentrated' epidemic), to a 'generalized' epidemic in all states. The virus does not discriminate by age, race, gender, ethnicity, sexual orientation, or socioeconomic status – everyone is susceptible. However, generally, certain groups are at particular risk of HIV, including men who have sex with men (MSM), injecting drug users (IDUs), and commercial sex workers (CSWs) (AVERT, 2009). UNAIDS (2010) reports that approximately 3.6% of the population are living with HIV/AIDS and 10% of the global population of PLWHA live in Nigeria.

Nigeria therefore still has a long way to go in tackling its devastating HIV and AIDS epidemic. In 2011, the Nigerian health minister acknowledged the extent of the challenge that Nigeria faces when he stated... 'The HIV and AIDS epidemic in Nigeria remains a public health problem of enormous magnitude that must be given priority attention' (UNAIDS, 2011).

2.3 Pharmacoeconomics

The roots of pharmacoeconomics are in health economics, a specialised aspect of economics developed in the 1960s. The concepts involved in pharmacoeconomics, such as cost-effectiveness and cost-benefit analysis, have been developed from the late 1970s. Beginning in the 1980s, measurement tools for health and clinical outcomes assessment were created and have subsequently been improved. Pharmacoeconomics emerged in the late 1980s as an independent entity among the varied specialised economic methods.

Over the past 20 years, pharmacoeconomics has become more important due to an increased emphasis on efficient drug therapies for disease, which increase health costs. Pharmacoeconomics is an innovative method that aims to decrease health expenditures, whilst optimising healthcare results.

The increasing cost of healthcare products and services has become a great concern for patients, healthcare professionals, insurers, politicians and the public. This increasing concern has prompted demand for the use of economic evaluations of alternative healthcare outcomes. This escalation in healthcare spending is due to increased life expectancy, increased technology, increased expectations, increased standards of living and an increased demand in healthcare quality and services. Healthcare resources are not easily accessible and affordable to many patients; therefore pharmacoeconomic

evaluations play an important role in the allocation of these resources. Pharmacoeconomics strives to guide the utilisation of healthcare resources optimally. Pharmacoeconomics addresses both economic and humanistic outcomes and it includes ideas and methods from a variety of domains including statistics, clinical epidemiology, economics, and decision analysis etcetera.

Pharmacoeconomics involves the utilisation of two major methodologies for health economics analysis: cost analysis and cost outcomes. Cost analysis considers the costs of providing healthcare products or services, but does not consider the outcomes experienced by patients or providers (Wertheimer *et al*., 2003).

There are four types of cost-outcomes analysis:

• Cost-minimisation analysis;

• Cost-effectiveness analysis;

• Cost-benefit analysis; and

• Cost-utility analysis.

The type of analysis used depends on the nature of the problem being studied.

2.3.1 *Cost-Effectiveness Analysis* is used to compare two or more treatment options for a specific condition. Cost-effectiveness is dependent on the value in nonmonetary terms that is placed on the outcome in relation to the cost.

2.3.2 *Cost-Minimisation Analysis* is a type of cost-effectiveness analysis that is used if two alternative therapies are determined to be the same, essentially. After determining the effectiveness, this method determines which treatment minimises costs. The pharmacoeconomic tool compares all the costs and consequences of two or more

therapeutic interventions. The objective of this method is to select the least costly among multiple equivalent interventions. This method is frequently used to compare brands with generics, different routes of administration and different settings of administration.

2.3.3 *Cost-Benefit Analysis* compares the costs and outcomes of alternative therapies and the outcome is then expressed in monetary terms. Cost-benefit analysis allows researchers to make comparisons across a wide variety of alternatives. It compares the costs involved in implementing a programme with the value of the outcome. Since the endpoints are measured in monetary terms, different endpoints can be studied, such as a surgical procedure compared with a pharmaceutical intervention.

2.3.4 *Cost-Utility Analysis* is performed in the same manner as cost-effectiveness analysis except that the endpoint differs. The endpoint of cost-utility analysis is described as 'quality-adjusted life years saved'. This allows cost-utility analysis to compare therapies for different diseases. Cost-utility analysis integrates both the costs and the consequences of a therapy into its comparison.

Cost utility measures the final outcomes in changes of life-expectancy. This method is often used when a programme affects morbidity and mortality.

Pharmacoeconomics is a multidisciplinary field; hence groups involved in pharmacoeconomics include pharmacoeconomists, epidemiologists, statisticians, data personnel and research personnel.

Data may be collected in a variety of ways, including patient self report questionnaires and direct data abstraction from patients' medical and employment records and bills.

There are three types of pharmacoeconomic studies:

• Prospective;

• Retrospective; and

• Model

Prospective studies are experimental studies that can be an additional part of a randomised clinical trial or strictly an economic evaluation. Prospective studies are the least useful because they require extensive time and money.

Retrospective studies are data analyses of clinical trials or cohort studies that were conducted previously. This type of study involves a comparison of treatment users and non-users that are followed from some point in the past to the present. Retrospective studies are the ideal study method.

Model studies are performed as a method of displaying data obtained from a variety of resources if previously studied data is unavailable. Modelling is an inexpensive and effective way of illustrating existing available data regarding the costs and outcomes of alternative therapeutic interventions.

The goal of these methods of pharmacoeconomic evaluation is to assess the value of pharmaceutical products and services while incorporating clinical, economic and humanistic outcomes.

Pharmacoeconomic analysis is important since payers such as third-party payers or government/ private health plans utilise them when determining whether to reimburse a claim. Physicians need to be aware of effective therapies that minimise costs.

Pharmacoeconomic analysis can be utilised to create clinical guidelines for physicians that will assist them in prescribing the most efficient drug (Wertheimer *et al*., 2003).

Pharmacoeconomics should be implemented into the formulary decision-making process in order to achieve the goal of the least expensive treatment with the best possible outcome. United States pharmaceutical companies often present pharmacoeconomic data when applying for a new drug approval from the FDA, when formulating clinical trial designs and when investigating break-even prices. Hospitals also use pharmacoeconomic data for formulary decision-making, treatment guidelines, drug utilisation reviews and disease management protocols.

Pharmacoeconomic evaluations are important tools used throughout the healthcare field in order to optimise healthcare expenditures, and we can expect to see their impact increase in the future.

The goal of pharmacoeconomics is to find the most effective and efficient treatment at the least cost, while optimising the outcomes of the patient and decreasing costs to society (Wertheimer *et al*., 2003).

Value-based pricing demands relative assessment of both the value of the pharmaceuticals or medical devices and the related cost. Hence, pharmacoeconomics is the science of setting a price commensurate with value (Crecon, 2007).

2.4 Cost-of -Illness Analysis

The COI is defined as the value of the resources that are expended or foregone as a result of a health problem. The COI includes health sector costs, the value of lost productivity by the patient (indirect cost), and the cost of pain and suffering (intangible costs) (CDC, 2009). COI is a pre-requisite for any of the pharmacoeconomic methods.

Various definitions of Pharmacoeconomics have evolved and these include:

Pharmacoeconomics refers to the scientific discipline that compares the value of one pharmaceutical drug or drug therapy to another. It is a sub-discipline of health economics. A Pharmacoeconomic study evaluates the cost (expressed in monetary terms) and effects (expressed in terms of monetary value, efficacy or enhanced quality of life) of a pharmaceutical product. Pharmacoeconomic studies serve to guide optimal healthcare resource allocation, in a standardized and scientifically grounded manner (Wikipedia, 2009).

The description and analysis of the cost of drug therapy to health care systems and the society. Value-based pricing demands relative assessment of both the value of the pharmaceutical or medical devices and the relative cost. This sort of assessment is the very substance of pharmacoeconomics. In other words, pharmacoeconomics is the science of setting a price commensurate with value (Crecon, 2007).

The scientific discipline of pharmacoeconomics uses various techniques to assess the value of pharmaceutical interventions and health strategies. Pharmacoeconomics evaluations provide information to optimally allocate health care resources and it is a sub-discipline of health economics (Health Economics, 2009).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Methodology

3.1.1 *Study Hospital*

Murtala Mohammed Specialist Hospital (MMSH), Kano, Nigeria is a state owned hospital which has been providing management to HIV/AIDS patients since 2005. The hospital serves as a referral centre to primary, secondary and other health care centres. It is supported by donor funded United States Agency for International development (USAID) organization. The agency provides the drugs and needed technical supports while the state provides the personnel. The clinic is accessed by patients from within and outside Kano state.

3.1.2 *Study Perspective*

This comprised both health care providers' and the patients' perspectives.

3.1.3 *Study Design*

Retrospective and cross-sectional methods were used to ensure collection of the necessary data.

3.1.4 Study Population

HIV/AIDS patients who were being managed at MMSH, Kano in the categories below formed our study population. They included:

1. Adult patients on HAART
2. Paediatric patients on HAART
3. Adult patients on co-trimoxazole prophylaxis only
4. Paediatric patients on co-trimoxazole prophylaxis only

5. All categories of health care workers involved in the management of the patients: doctors, pharmacists, nurses, pharmacy technicians, laboratory scientists and data entry clerks.

3.1.5 *Study Period*

The study was from 1st January 2010 to 31st December 2010 and it comprised of patients who were registered in the clinic on or before 1st January 2010.

3.1.6 *Data Source*

Data were mainly generated directly from the patients and allied health care workers directly involved in their care (primary data), and also from patient folders and other records (secondary data) kept in the clinic.

For the patients, questionnaires were employed and the data collected included patient socio-demographic data, medical history, therapeutic interventions as well as other interventions as per the questionnaire. Questionnaires were also used to collect details of staff grade level, average number of patients seen, number of hours worked per day as well as average time spent on a patient by the health workers.

Details of these are referenced in the appendix section of this thesis.

Costs of drugs were obtained from the pharmacy department of the hospital as well as from reputable pharmacies in Kano.

Transport costs were confirmed from staff of the National Union of Road Transport Workers (NURTW).

Cost of the various diagnostic tests were obtained from the hospital laboratory as well as privately owned reputable laboratories.

Personnel salaries were obtained from the accounts department of the hospital.

For the costs, average costs were determined and used for further analysis.

Consent was obtained from the appropriate authorities (ethical approval) as well as the individuals.

Information obtained during the course of this study was treated as confidential, and used exclusively for this study.

3.1.7 *Sample Size Determination*

The number of patients enrolled into the programme since inception was found to be 8,657. The number of patients that accessed the clinic within the study period was 3,333 (3,005 adults; 961 males, 2,044 females and 328 children; 174 males, 154 females). Applying the calculations for sample sizes less than 10,000, the sample sizes derived was approximately 284. Using proportion, the samples were 256 adults (82 males, 174 females) and 28 children (15 males, 13 females). A detail of this calculation is shown in the appendix section. The patients were then chosen purely by chance that is when the target is adult male, any adult male patient attending the clinic had a fair chance of being chosen (simple random sampling).

The health care workers involved in the HIV/AIDS clinic included four doctors, four nurses, two pharmacists, two pharmacy technicians, two laboratory technicians and two data entry clerks.

3.1.8 *Statistical Analyses and Data Presentation*

Data collected were analysed using Statistical Package for the Social Scientist (SPSS) Version 16 and the results were mostly presented as charts and tables.

3.1.9 *Pharmacoeconomic Method*

Cost of illness analysis: The method used was in accordance with that outlined by CDC in 2009.

3.2 Limitations of the Study

1. Patients records were not all found in their folders making retrieval cumbersome.
2. Hospital beds and folders were issued free, decreasing the overall burden as compared to other hospitals who charged for these services.
3. Use of more than one folder within the same hospital by patients interfered with accuracy of data collected.
4. Use of other hospitals for emergencies and hospitalization also interfered with outcome of the study.

CHAPTER FOUR

RESULTS

4.1 Clinic Population and Clinic Days

MMSH holds HIV/AIDS clinic at two different sites within the hospital namely the family care centre (FCC) and the adult ART (AART) site. FCC runs its clinic three times a week, on Tuesdays, Wednesdays and Thursdays while the AART site runs four clinics a week on Mondays, Wednesdays, Thursdays and Fridays. Both clinics record an average of 50 patients a day. The total number of patients recorded between 1 January 2010 and 31 December 2010 were 3,333 (328 of whom were less than 14years and 3,005 of whom were 14 years and above) and this yielded a corresponding sample size of 284.

4.2 Patients Bio Data

4.2.1 *Age*

Children less than 15 years of age made up 10.6% of the patients (Table 4.1). Majority of the patients (87.7%) fell within the ages 15-49, which constituted the economically vibrant population.

4.2.2 *Sex*

There were more female patients 188 (66.2%) than males 96 (33.8%) within the period of the study.

Table 4.1: Age Distribution of HIV/AIDS Patients at Murtala Muhammad Specialist Hospital, Kano

Age group	Frequency (No. of Patients)	Percent (%)
<15	30	10.6
15 – 19	5	1.8*
20 – 24	26	9.2*
25 - 29	56	19.7*
30 – 34	67	23.6*
35 – 39	41	14.4*
40 - 44	38	13.4*
45 – 49	16	5.6*
50 – 54	1	0.4
55 - 59	4	1.4
Total	284	100.0

*The economically viable age group which cumulatively is 87.7%.

4.2.3 *Education*

Only 5.99% of the patients had received a tertiary education and this account for the lowest distribution. This was closely followed by those with no education at all (10.56%). A total of 52.11% had received a form of formal education and 37.32% had received Islamic education only (Fig 4.1).

4.2.4 *Marital Status*

Majority of the patients (71.84%) were married while 12.68% were single. The rest of the patients were either widowed or divorced (Fig. 4.2).

4.2.5 *Occupation*

Approximately forty percent (39.8%) of the patients were unemployed, inclusive of unemployed housewives while professionals accounted for the least value of 0.7% (Fig 4.3).

4.2.6 *Income*

About 50% (45.1%) of the patients within this period had no income and 27.1% had a monthly income of < ₦20,000 (Fig 4.4).

4.2.7 *Household Size*

Majority of the patients (63.03%) were from household sizes of <6 and only 3.17% had a size of >12 (Table 4.1).

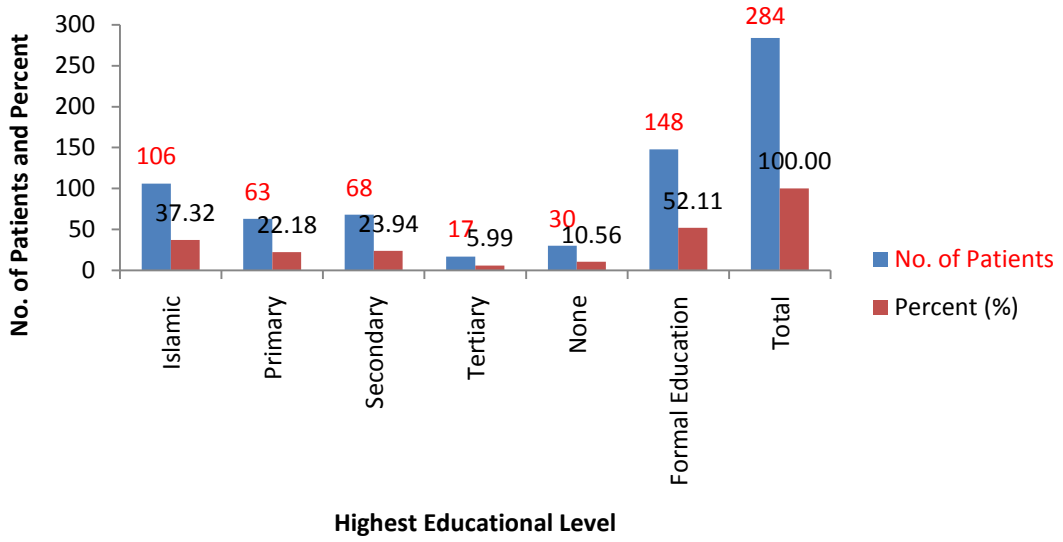

Fig 4.1: Highest Educational Qualification of HIV/AIDS Patients at Murtala Muhammad Specialist Hospital, Kano

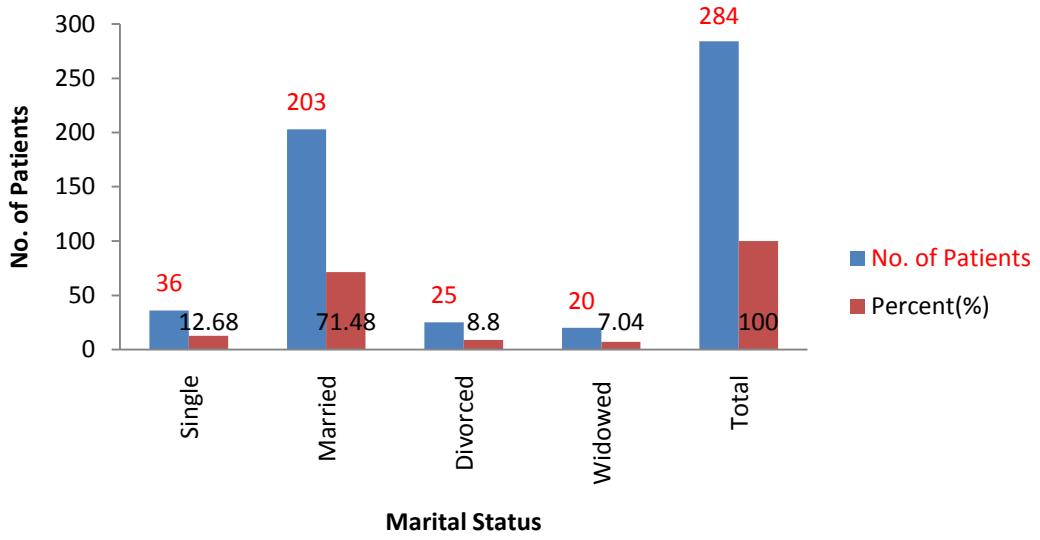

Fig 4.2: Marital Status of HIV/AIDS Patients at Murtala Muhammad Specialist Hospital, Kano

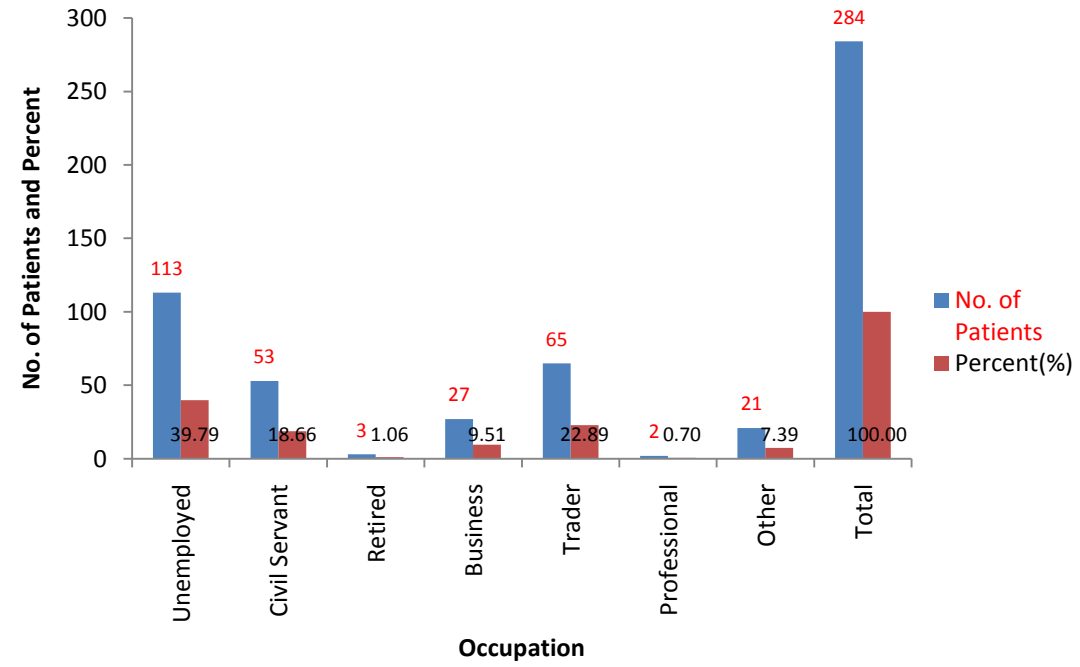

Fig 4.3 Occupation of HIV/AIDS Patients Who Attended the Clinic

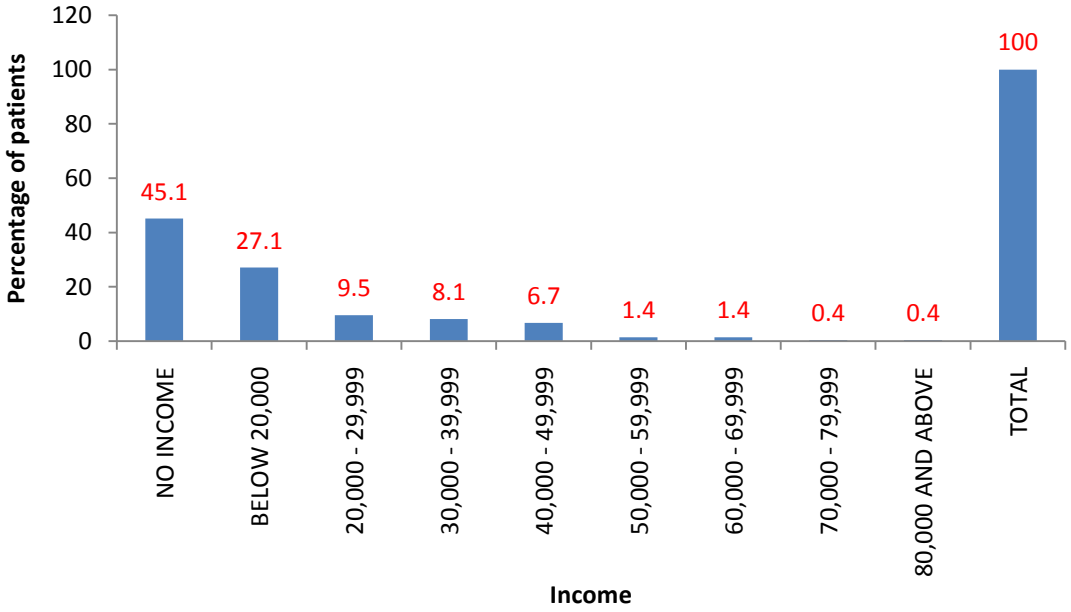

Fig 4.4: Income of HIV/AIDS Patients Who Attended the Clinic

Table 4.2: Household Size of HIV/AIDS Patients Who Attended the Clinic

Household Size	Frequency(No. of Patients)	Percent (%)
Up to 6	179	63.03
7 - 12	96	33.80
More than 12	9	3.17
Total	284	100.00

4.2.8 *Financial Sponsors/Sources*

Only 38.03% of the patients were responsible for their needs with the remaining population being financially cared for by family members, notably spouse (37.32%) as shown in Table 4.3.

4.3 Medical History

4.3.1 *Diagnostic Tests*

One hundred and forty nine patients (52.5%) had had one CD4 count done within the reporting period, while 43.0% had done it twice and 0.4% had done it four times (Table 4.4). 64 patients had also had their packed cell volume (PCV) done followed by chest X-ray and malaria parasite and Widal test both of which had 18 patients respectively (Fig 4.5).

4.3.2 *Treatment Category*

Majority of the patients (94.37%) were on anitretrovirals (ARVs), while 5.63% were on co-trimoxazole prophylaxis (not yet eligible to start ARVs). Of the patients on ARVs, most were on zidovudine, lamivudine and nevirapine combination (Fig 4.6).

4.3.3 *Co-morbid Illness*

Hypertension was shown to be the most occurring co-morbid illness closely followed by TB (Fig 4.7); the drugs mostly utilized to manage these patients were Acetyl Salicylic Acid 75mg (Vasoprin), Anti-tuberculoid cocktail (Akurit Kit) and Amiloride/Hydrochlorthiazide (Moduretic) respectively (Fig 4.8).

Table 4.3: Financial Sponsor/Sources of HIV/AIDS Patients Who Attended the Clinic

Sponsor	Frequency (No. of Patients)	Percent (%)
Sibling	17	5.99
Children	5	1.76
Parents	45	15.85
Grand-parents	3	1.06
Spouse	106	37.32
Self	108	38.03
Total	284	100.00

Table 4.4: Frequency of CD4 Count and Chemistry Tests

No. of Times	Frequency (No. of Patients)	Percent (%)
1	149	52.5
2	122	43.0
3	12	4.2
4	1	0.4
Total	284	100

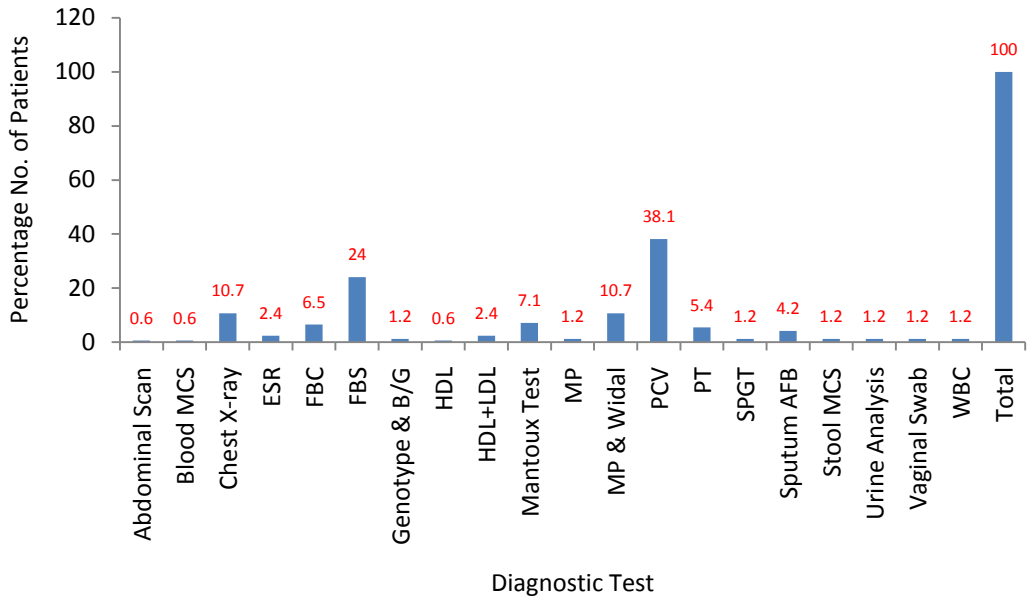

Fig 4.5: Frequency of Diagnostic Tests other than CD4 Count
Bld MCS=Blood micro culture and sensitivity, ESR=Erythrocyte sedimentation rate, FBC=Full blood count, B/Group=Blood Group, HDL=High density lipoprotein, LDL=Low density lipoprotein, MP=Malaria parasite test, PCV=Packed cell volume, PT=Pregnancy test, SPGT=Serum glutamic oxaloacetic transaminase AFB=Acid fast bacilli and WBC=White blood cell count

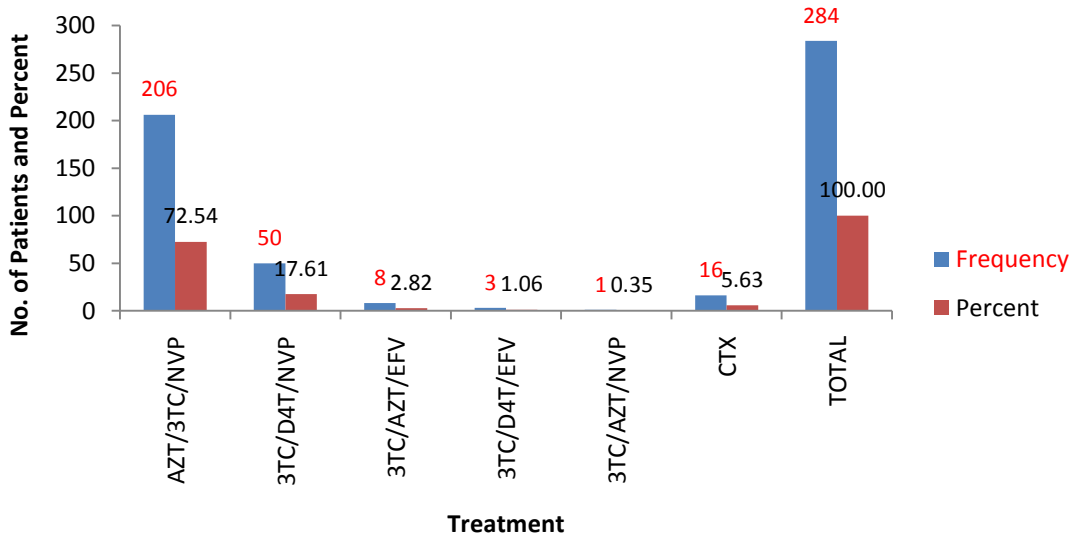

Fig 4.6: Frequency of Antiretroviral Drug Regimen
AZT=Zidovudine, 3TC=Lanivudine, NVP=Nevirapine, D4t=Stavudine, EFV=Efavirenz, CTX=Cotrimoxazole

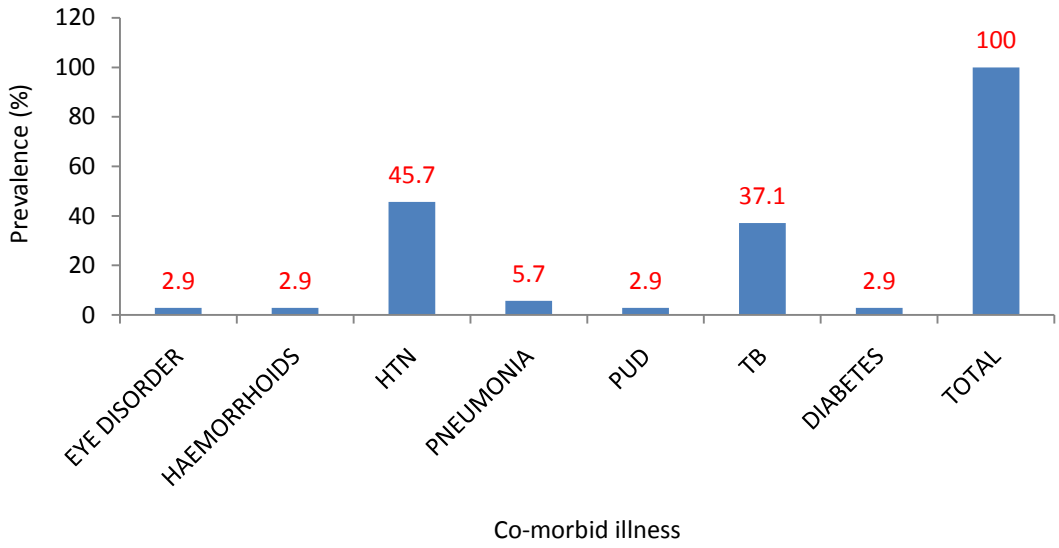

Fig 4.7: Prevalence of Co-Morbid Illness
HTN=Hypertension, PUD=Peptic ulcer disease, TB=Tuberculosis

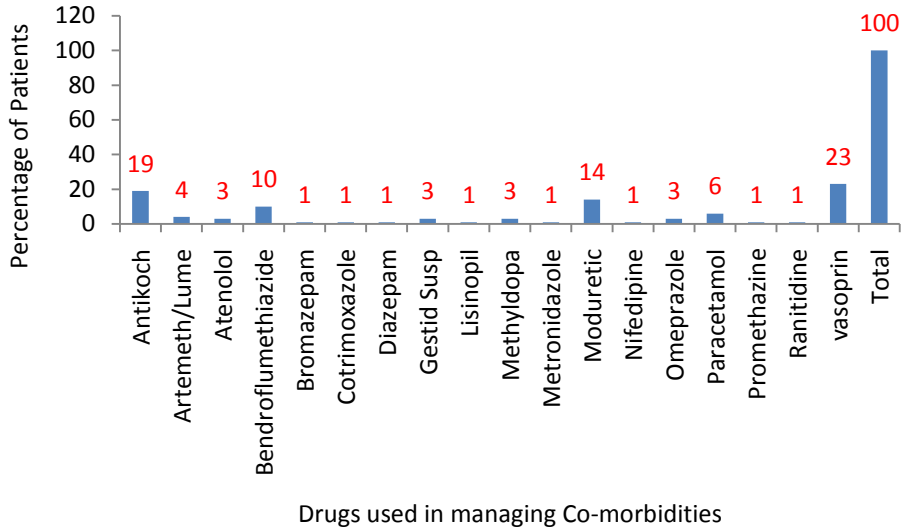

Fig 4.8: Drugs Used In Managing the Co-morbid Illnesses
Anti Koch=Rifampicin+Isoniazid+Pyrazinamide+Ethambutol,
Artemeth=Lume-Artemether+Lumefantrine

4.3.4 *Self-medication*

Antimalarials accounted for the most self-medication drugs, being 41%, while non Steroidal Anti-inflammatory Drugs (NSAIDs) accounted for 18% (Fig 4.9).

4.3.5 *Side Effects and Adverse Drug Reactions*

Only 31 patients (10.9%) had suffered a serious SE or ADR, while 89.1% had not.

4.3.6 *Emergency Room Visits*

Majority of the HIV/AIDS patients (62.32%) had never had an ER visit and only 20.07% had visited once. The percentage mostly decreased with increasing number of visits (Table 4.5).

4.3.7 *Hospitalization*

Most of the patients (87.68%) had never been hospitalised and 11.27% had been hospitalised once.

4.3.8 *Alternate Source of Care*

Only eleven of the sample (3.87%) had NHIS coverage, three (1.06%) had retainer services with another hospital, while twelve (4.22%) of them admitted to have used traditional medicine (Table 4.6).

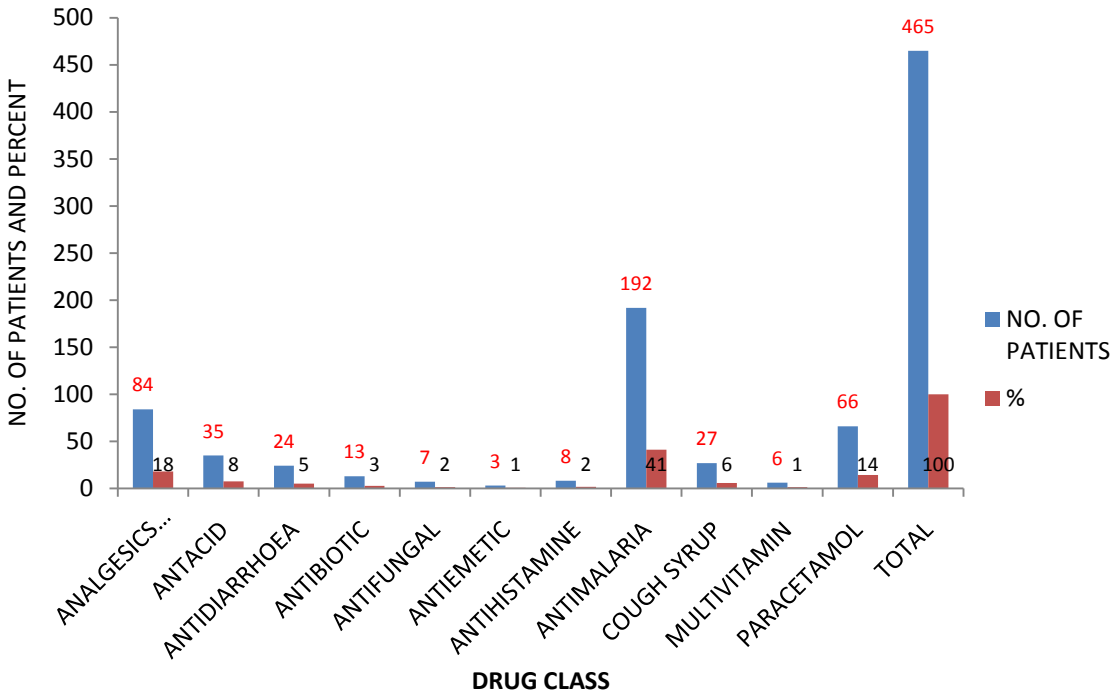

Fig 4.9: Classes of Drugs Used In Self-medication

Table 4.5: Frequency of Emergency Room Visits

Emergency Room Visit	Frequency (No. of Patients)	Percent (%)
0	177	62.32
1	57	20.07
2	23	8.10
3	14	4.93
4	3	1.06
5	3	1.06
6	3	1.06
7	1	0.35
8	2	0.70
9	1	0.35
Total	284	100.00

Table 4.6: Alternate Source of Care

Care	Frequency (No. of Patients)	Percent (%)
None	258	90.85
National Health Insurance Scheme	11	3.87
Retainer Practice	3	1.06
Traditional medicine	12	4.22
Total	284	100.00

4.4 Costs

4.4.1 *Transport Cost to the Hospital*

Total transport cost utilising the various places of residence as well as the number of visits was calculated to be ₦748,120 for all patients with an average cost per patient estimated to be ₦2,634 (Table 4.7).

4.4.2 *Cost Contribution of Health Care Personnel*

The HCW consisted of doctors, pharmacists, nurses, pharmacy technicians, laboratory scientists and data entry clerks (Table 4.8). Their various contributions were shown and their average annual cost per patient in the period under review was found to be ₦40,008.

4.4.3 *Cost Contribution of Laboratory Investigations*

The CD4 count and blood chemistry tests cost ₦6,000 each. A total of 433 tests were carried out within the reporting period, making total cost for CD4 count test to be ₦2,598,000. Average cost was then calculated to be N9,147 per patient.

Other laboratory tests cumulatively cost ₦74,450 with an average cost of ₦448 per patient (Table 4.9), PCV being the most costly of the remaining diagnostic tests. The average cost of each test was also shown on the same table.

Table 4.7: Transport Costs to the Hospital Incurred by the Patients

Place of Residence	Cost (₦)	No. of Visits	Total Cost (₦)	% of total cost
Ahmadiyya	100	28	2,800	0.37
Bachirawa	100	50	5,000	0.67
Badawa/Kawo	140	46	6,440	0.86
Bagwai	700	18	12,600	1.68
Baurara	600	40	24,000	3.21
Bebeji	700	8	5,600	0.75
Bichi	600	41	24,600	3.29
Bidu	400	8	3,200	0.43
Brigade/kwanan Jabba	200	166	33,200	4.44
Chiromawa	300	12	3,600	0.48
Dakatsalle	140	9	1,260	0.17
Dambatta	700	24	16,800	2.25
Dandishe	400	27	10,800	1.44
Daurawa	600	21	12,600	1.68
Dawakin Kudu	700	26	18,200	2.43
Doguwa	600	15	9,000	1.20
Dorayi	240	82	19,680	2.63
Fagge	100	106	10,600	1.42
Farawa	100	12	1,200	0.16
Gabasawa	240	8	1,920	0.26
Gada Tamburawa	250	29	7,250	0.97
Gadan Kaya	140	18	2,520	0.34
Garko	400	11	4,400	0.59
Garun Mallam	300	10	3,000	0.4
Gaya	600	72	43,200	5.77
Gezawa	400	47	18,800	2.51
Gobirawa	250	17	4,250	0.57
Gorondutse	80	8	640	0.09
Gwale	80	52	4,160	0.56
Gwammaja	180	28	5,040	0.67
Gwarzo	80	19	1,520	0.20
Gyadi Gyadi/Ung. Uku	80	33	2,640	0.35
Hausawa	120	102	12,240	1.64
Hotoro/mariri	140	8	1,120	0.15
Jahun	800	28	22,400	2.99
Jamaa're	1200	10	12,000	1.60
Jogana	800	19	15,200	2.03
Kabo baiki	300	12	3,600	0.48
Karaye	500	9	4,500	0.60
Katsina	1400	15	21,000	2.81
Katsina Road	140	20	2,800	0.37
Kawaji/Dakata	160	60	9,600	1.28
Kibiya	400	13	5,200	0.70
Kofar Mata/Nasarawa	40	40	1,600	0.21

Table 4.7: Transport Costs to the Hospital Incurred by the Patients *(continued)*

Place of Residence	Cost (₦)	No. of Visits	Total Cost (₦)	% of total cost
Kofar Mazugal	180	10	1,800	0.24
Kofar Ruwa	240	12	2,880	0.38
Koki	60	9	540	0.07
Kumbotso	240	9	2,160	0.29
Kura	200	18	3,600	0.48
Kurna	100	207	20,700	2.77
Kwana dangora	400	25	10,000	1.34
Kwanar diso	300	11	3,300	0.44
Magashi	600	8	4,800	0.64
Makwalla	300	9	2,700	0.36
Malumfashi	1000	10	10,000	1.34
Mandawari	60	9	540	0.07
Naibawa	100	143	14,300	1.91
Rano	500	27	13,500	1.80
Rijiyan lemo	200	65	13,000	1.74
Rijiyar zaki	140	43	6,020	0.80
Rimin Gado	240	17	4,080	0.55
Rimin Kebe	140	44	6,160	0.82
Rogo	1200	32	38,400	5.13
Sabon Gari	140	34	4,760	0.64
South Africa	4000	8	32,000	4.28*
Sabon Titi	120	8	960	0.13
San mai nagge gwale	80	42	3,360	0.45
Sharada	160	55	8,800	1.18
Sheka	160	29	4,640	0.62
Sumaila	600	10	6,000	0.8
Tarauni/Hotoro/Mariri	140	159	22,260	2.98
Tashan Baure	500	22	11,000	1.47
Tiga	500	8	4,000	0.53
Tudun Wada	300	26	7,800	1.04
Ungogo	400	16	6,400	0.86
Unguwan Dabai	300	18	5,400	0.72
Wudil	500	8	4,000	0.53
Yakassai	40	54	2,160	0.29
Yalwa	500	10	5,000	0.67
Zaria	1000	11	11,000	1.47
Zawaciki/ciranci/pan	200	80	16,000	2.14
Zoo Road	80	29	2,320	0.31
Total Cost			₦748,120	
No. of Patients			284	
Average Cost per Patient			₦2,634	

*South Africa-Nigeria travel not used in the calculations.

Table 4.8: Health Care Personnel Cost to the Health Sector

Costs	Personnel Cadre						
	Doctors	Pharmacists	Nurses	Pharmacy Technicians	Laboratory Scientists	Data Entry Clerks	Total (₦)
Annual Gross Salary (₦)	9,600,000	2,592,000	4,615,200	1,120,800	3,040,800	480,000	21,448,800
Work Hours/Week	40	40	40	40	40	40	
No. of Weeks/Annum	52	52	52	52	52	52	
Mean Salary/Minute (₦)	76.92	20.77	36.98	8.98	24.37	3.85	
Average Time Spent per Patient (minutes)	15	10	5	3	15	1	
Average Cost per Visit (₦)	1,153.85	207.69	184.90	26.94	365.48	3.85	1,942.71
Total No. of Visits	6,240	6,240	6,240	6,240	4,160	6,240	
Total Cost (₦)	7,200,000	1,296,000	1,153,800	168,120	1,520,400	24,000	11,362,320
Number of Patients	284	284	284	284	284	284	
Average Annual Cost per Patient (₦)	25,352.11	4,563.38	4,062.68	591.97	5,353.52	84.51	
Annual Cost of Healthcare Personnel per Patient			₦40,008				

Table 4.9: Cost of Laboratory Investigations other than CD4 Count by the Patients

Investigation	Costs				
	Unit Cost (₦)	No. of Tests	Total Cost (₦)	No. of Patients	Average Costs (₦)
Abdominal Scan	1,200	1	1,200	1	1,200
Chest X-Ray	800	18	14,400	17	847
ESR	200	4	800	4	200
FBC	400	11	4,400	10	440
FBS	200	4	800	4	200
Genotype, B/group	650	3	1,950	3	650
HDL	800	1	800	1	800
Mantoux Test	400	12	4,800	12	400
MPs	400	2	800	2	400
MPs & Widal	1,000	18	18,000	17	1,059
PCV	200	64	12,800	52	246
PT	150	13	1,950	13	150
Sputum AFB	300	10	3,000	7	429
Stool MCS	250	2	500	2	250
HDL + LDL	1.200	4	4,800	4	1,200
MCS	250	1	250	1	250
ALT	700	1	700	1	700
Vaginal Swab	500	2	1,000	2	500
WBC	200	2	400	2	200
AST	700	1	700	1	700
Urinalysis	400	1	400	1	400
Total Cost			₦74,450		
Total No. of Tests			160		
Average Cost of Tests			₦448		
Average Cost per Patient (284 patients)			₦262		

Bld MCS=Blood micro culture and sensitivity, ESR=Erythrocyte sedimentation rate, FBC=Full blood count, B/Group=Blood Group, HDL=High density lipoprotein, LDL=Low density lipoprotein, MP=Malaria parasite test, PCV=Packed cell volume, PT=Pregnancy test, AST=Aspartate aminotransferase, ALT=Alanine aminotransferase, AFB=Acid fast bacilli and WBC=White blood cell count

4.4.4 *Cost of Drugs*

Cost of ARVs

The average costs for the individual regimen are shown on the Table 4.10. The average cost of ARVs per patient was estimated to be ₦270,291.

Cost of Drugs Used in Managing Opportunistic Infections and other illnesses

Drugs used in management of OIs and other illnesses cost a total of ₦524,753 and an average cost per patient of ₦856 (Table 4.11a) to the health sector and ₦156,479 with an average cost per patient ₦352 (Table 4.11b) to the patients.

Cost of Drugs Used in Managing Co-morbid Illnesses

The anti-tuberculosis cocktail (Akurit kit) was used by the health facility and cost a total of ₦39,000 to 13 patients with an average cost of ₦3,000. The total cost of other drugs used by the patients was ₦29,172 and average cost per patient of ₦521.

Cost of Drugs Used in Self-medication

The total cost of self-medication which was borne by the patients amounted to ₦151,030 and an average of ₦324 per patient. The costs of various drugs are also shown in Table 4.13.

Table 4.10: Cost of ARVs to the Health Sector

ARV	Costs				
	Unit Cost (₦)	No. of units	Total Cost (₦)	No. of Patients	Average Cost (₦)
3TC/AZT/NVP	1,937.52	35,525	68,830,398.00	203	339,066.00
3TC/D4T/NVP	1,157.52	2,680	3,102,153.60	70	44,316.48
3TC/AZT/EFV	2,859.48	98	280,229.04	7	40,032.72
3TC/D4T/EFV	2,001.48	60	120,088.80	3	40,029.60
TDF/FTC/NVP	2,469.48	1	2,469.48	1	2,469.48
3TC/TDF/NVP	2,079.48	18	37,430.64	5	7,486.13
3TC/AZT/NVP*	702.00	92	64,584.00	6	10,764.00
3TC/D4T/NVP*	708.24	1	708.24	1	708.24
Total Cost			₦72,438,062		
Total No. Issued / Patients on ARVs			268		
Average Cost of Drugs			₦270,291		
Average Cost of Drugs per Patient (284 patients) ₦255,063					

*Paediatric formulation of the drugs

AZT=Zidovudine, 3TC=Lanivudine, NVP=Nevirapine, D4t=Stavudine, EFV=Efavirenz, CTX=Cotrimoxazole

Table 4.11a: Cost of Drugs Used in management of Opportunistic Infections and other illnesses by the Health Sector

Drug	Costs				
	Unit Cost (₦)	No. of Units	Total Cost (₦)	No. of Patients	Average Cost (₦)
Acyclovir	72	20	1,440	1	1,440
Cotrimoxazole	2	191,750	383,500	246	1,559
Ferrous Sulphate	1	23,580	23,580	111	212
Fluconazole	80	730	58,400	37	1,578
Ketoconazole	10	14	140	1	140
Loperamide	7	130	910	8	114
Multivitamin Syrup	120	38	4,560	18	253
Multivitamin Tablet	1	45,673	45,673	189	242
Nystatin Drop	280	10	2,800	6	467
ORS	30	125	3,750	14	268
Total Cost			₦524,753		
No. of OI Units Issued			613		
Average Cost of OI			₦856		
Average Cost of OI per patient (284 patients)			₦1,848		

Table 4.11b: Cost of Drugs Used in Management of Opportunistic Infections and other illnesses by the Patients

Drugs	Costs				
	Unit Cost (₦)	No. of Units	Total Cost (₦)	No. of Patients	Average Cost (₦)
Albendazole	100	7	700	6	1,440
Amoxicillin	7	315	2,205	15	147
Amoxycillin/Clavulanic acid	90	202	18,180	13	1,398
Ampicillin/Cloxacillin	7	80	560	8	70
Artemether/Lumefantrine	30	1,466	43,980	64	687
Artesunate/Fansidar	55	16	880	2	440
Astymin	500	2	1,000	2	500
Azithromycin	217	18	3,900	3	1,300
Benylin Syrup	200	1	200	1	200
Betamethasone /Clotrimozole/Neomycin Cream	200	17	3,400	16	212
Betamethasone Cream	200	1	200	1	200
Bromhexine Syrup	150	3	450	3	150
Calamine Lotion	100	1	100	1	100
Capsules Astyfer	20	30	600	1	600
Chloramphenicol	5	150	750	4	188
Chlorpheniramine	1.5	144	216	14	15
Ciprofloxacin	48	621	29,808	36	828
Clarithromicin	120	90	10,800	4	2,700
Clotrim Vaginal Cream	450	6	2,700	6	450
Clotrim Vaginal Tab	70	42	2940	7	420
Cotrimoxazole	2	235	470	5	94
Cough Syrup	150	8	1,200	8	150
Dexamethasone	5	15	75	1	75
Doloneurobion	70	74	5,180	1	5,180
Doxycycline	7	118	826	11	75
Erythromycin	20	140	2,800	5	560
Fansidar	60	3	180	3	60
Folic Acid	1	30	30	1	30
Gestid Antacid	350	8	2,800	6	467
Gynotrogyn	700	2	1,400	2	700
Hydrocotisone Cream	200	1	200	1	200
Hyoscine N-Methyl Bromide	7	10	70	1	70
Ibuprofen	2	288	576	64	9
Jawasil	200	2	400	2	200
Ketoconazole	10	14	140	1	140
Lexotan	25	20	500	5	100
Loperamide	7	130	910	8	100

Table 4.11b: Cost of Drugs Used in Management of Opportunistic Infections and other illnesses by the Patients (*Continued*)

Drugs	Costs				
	Unit Cost (₦)	No. of Units	Total Cost (₦)	No. of Patients	Average Cost (₦)
Loratidine	10	30	300	3	114
Maxiron	3	156	468	2	234
Mebendazole	10	6	60	1	60
Metronidazole	2	789	1,578	24	66
Mist Potassium Citrate	270	1	270	1	270
Multivite	1	560	560	5	112
Nystatin Oral Tabs	15	200	3,000	3	1,000
Omeprazole	21	91	1,911	3	637
Optalidon	60	6	360	1	360
Paracetamol	1.5	1,235	1,853	29	64
Piroxicam	8	60	480	5	96
Promethazine	30	1	30	1	30
Pyrantel Palmoate	20	8	160	2	80
Quinine	10	48	480	1	480
Ranferon-12	200	2	400	2	200
Salbutamol	1	31	31	3	10
Strepsil	40	15	600	1	600
Tinidazole	40	28	1,120	3	373
Tramadol	25	40	1,000	5	200
Triprolidine/Pseudoephedrine syrup	7	5	35	1	35
Vit B-Complex	1	45	45	3	15
Vitamin C	1.5	208	312	12	26
Zinc Oxide	100	1	100	1	100
Total Cost			₦156,479		
No. of OI Units Issued			444		
Average Cost of OI			₦352		
Average Cost per Patient (284 patients)			₦551		

Table 4.12: Cost of Drugs Used in Management of Co-morbid Illness by the Patients

Drugs	Costs				
	Unit Cost (₦)	No. of Units	Total Cost (₦)	No. of Patients	Average Cost(₦)
Artemether/Lumefantrine	30	60	1,800	3	600
Atenolol	15	36	540	2	270
Bendroflumethiazide	5	283	1,415	7	202
Bromazepam	25	5	125	1	125
Co-trimoxazole	2	40	80	1	80
Diazepam	1	5	5	1	5
Gestid Suspension	350	10	3,500	2	1,750
Lisinopril	20	90	1,800	1	1,800
Methyl-dopa	9	54	486	2	243
Metronidazole	2	60	120	1	120
Moduretic	10	910	9,100	10	910
Nifedipine	15	60	900	1	900
Omeprazole	21	70	1,470	2	735
Paracetamol	1.5	123	185	4	46
Promethazine	7	10	70	1	70
Ranitidine	10	48	480	1	480
Vasoprin	2	3,548	7,096	16	444
Total Cost			₦29,172		
No. of Units Issued			56		
Average Cost of Treatment			₦521		
Average Cost per Patient (284 patients)			₦103		

Table 4.13: Cost of Drugs Used in Self-medication by the Patients

Drugs	Costs		
	Total Cost (₦)	No. of Patients	Average Cost (₦)
Analgesic other than PCM	15,620	84	186
Antacid	7,680	27	284
Antibiotic	5,440	13	419
Antidiarrhoea	9,550	28	341
Antiemetic	100	2	50
Antifungal	4,750	7	679
Antihelmintic	100	1	100
Antihistamine	1,560	13	120
Antimalarial	86,800	192	452
Cough Syrup	8,040	27	298
Multivitamin	6,110	6	1,018
Paracetamol(PCM)	5,280	66	80
Total Cost	₦151,030		
No. of Units Issued	466		
Average Cost	₦324		
Average Cost of Drugs per Patient (284 patients)	₦532		

Cost of Drugs Used in Managing Side Effects/Adverse Drug Reactions

SEs/ADRs accounted for a total cost of ₦1,092 and an average cost per patient of ₦109. Cost of individual drugs is also shown in Table 4.14.

Cost of drugs for Hospitalisation

Hospitalisation accounted totally of ₦45,500 resulting in an average cost of ₦1,300 to the patients.

4.4.5 *Productivity losses*

A total of 141 patients accounted for 1,218 lost days of work. Productivity loss was estimated to be ₦680,587, an average of ₦4,827 per patient within this reporting period. This is shown in Table 4.15.

4.4.6 *Summary of Estimated Costs to Health Sector and the Patients*

Various contributions to cost were put into consideration as shown in Table 4.16. Direct medical-costs to the health sector for the reporting period was ₦86,962,135 and the average cost per individual ₦323,303. ARVs made the highest contribution accounting for 83.6% of the total direct medical cost to the health sector.

Direct-medical costs to the patient was ₦456,703. Average cost per patient was calculated to be ₦3,055. Hospitalization made the most contribution (42.55%) to direct medical cost to the patient.

Direct non-medical costs to the patient totalled ₦748,120 and average cost per patient of ₦2,634.

Indirect cost to the patient totalled ₦680,586 and an average cost per patient of ₦4,827.

Overall, the total direct and indirect annual cost of HIV/AIDS management per patient at MMSH, Kano was found to be ₦323,303 and ₦10,516 for the heath sector and patient respectively.

Table 4.14: Cost of Treating Side Effect/Adverse Drug Reactions by the Patients

Drugs	Costs				
	Unit Cost (₦)	No. of Units	Total Cost (₦)	No. of Patients	Average Cost (₦)
Beclomethasone/ Clotrimazole/Neomycin Cream	180	1	180	1	180
Doloneurobion	10	40	400	2	200
Hydrocortisone Cream	150	1	150	1	150
Ibuprofen	2	30	60	1	60
Loratadine	15	10	150	1	150
Metoclopropamide	1	10	10	1	10
Paracetamol	1.5	18	27	1	27
Vitamin B-Complex	1	15	15	1	15
Zinc Oxide Cream	100	1	100	1	100
Total Cost			₦1,092		
No. of SE/ADR Incidence			10		
Average Cost			₦109		
Average Cost per Patient (284 patients)			₦4		

Table 4.15: Contributions to Productivity Losses by the Patients

Occupation	Total Lost Work days	Average Earnings per Month(₦)	Earnings per Day(₦)	Productivity Losses(₦)
Unemployed	290	0	0	0
Housewife	6	0	0	0
Civil Servant	435	30,391	1,013.05	440,675
Retired	0	7,000	233.33	-
Business	102	27,241	908.02	92,619
Trader	210	8,277	275.90	57,939
Professional	14	25,000	833.33	11,667
Other	161	14,476	482.53	77,688
Total Productivity Loss				₦680,588
No. of Absenteeism				141
Average Productivity Loss				₦4,827
Average Cost per Patient (284 patients)				₦2,396

Table 4.16: Summary of Estimated Costs to Health Sector and the Patients

Cost Category	Health Sector				Patients			
	Total Cost (₦)	No. of Patients	Ave. Cost (₦)	%	Total Cost (₦)	No. of Patients	Ave. Cost (₦)	% [d]
Direct Medical Cost								
Health Care Personnel	11,362,320	284	40,008	12.37	-	-	-	-
Laboratory Tests	2,598,000	284	9,148	2.83	74,450	160[a]	449	14.70 (4.27)
Antiretroviral Drugs	72,438,062	268[a]	270,291	83.60	-	-	-	-
Opportunistic Infection Drugs	524,753	613[a]	856	0.26	156,479	444[a]	352	11.52 (3.35)
Co-morbid Illness	39,000	13[a]	3,000	0.92	29,172	56[a]	521	17.05 (4.95)
Self Medication	-	-	-	-	151,030	465[a]	324	10.61 (3.08)
SEs/ADRs	-	-	-	-	1,092	10[a]	109	3.57 (1.04)
Hospitalization[b]	-	-	-	-	45,500	35[a]	1,300	42.55 (12.36)
Total	86,962,135		323,303		456,723		3,055	
Direct Non Medical Cost								
Transport	-	-	-	-	748,120	284	2,634	(25.05)
Indirect Cost								
Productivity Loss[c]	-	-	-	-	680,587	141	4,827	(45.90)
Total Costs(₦)			323,303				10,516	(100.00)

a=*Total No. of patients for cost category*

b=*Cost of hospitalization to health sector could not be measured*

c=*Cost to patient only; those of care givers were not estimated*

d=*relative to patients' direct medical cost (and all costs)*

CHAPTER FIVE

DISCUSSION

Generally, the data presented here suggest that the management of HIV/AIDS at the Murtala Mohammed Specialist Hospital, Kano, Nigeria pose a serious economic burden on the health care system and those living with the disease. The study showed that children less than 15 years made up 10.6%, while adults above the age of 50 years account for 1.8%, leaving the economically viable population (15-49 years) with the highest percentage (87.65) of the patients living with this debilitating disease. UNAIDS, WHO (2008) reported that in developing countries most population with HIV/AIDS are within this group. HIV/AIDS is associated with high morbidity and mortality within this group and likely to cause strain on resources as this group is likely to have responsibilities and dependents.

The study also showed that females accounted for 66.2% of HIV/AIDS. This is in accordance with literature which says more than 50% of those infected are women (WHO, 2009). It would also be pertinent to note that the study was carried out in the Northern part of Nigeria where polygamy is widely practiced and could contribute to female infected population. Population Council Inc. (2007) reported that females <15 years of age in northern Nigeria are less likely to receive information on HIV/AIDS and are less likely to continue their education.

The study showed those with tertiary education had the lowest percentage (5.99%) and those with only Islamic education the highest. A study by Hargreaves *et al*. (2010), in Tanzania showed that changes in HIV prevalence differed by educational attainment level with HIV prevalence stable among those with no education, a small but borderline significant decline among those with primary education, and a larger statistically significant decline among those with secondary education.

Furthermore, the married, divorced or widowed who were more likely to have to have had unprotected sexual relations constituted the groups with the highest cases of the disease in this study. Our results agree with the report of Kennedy *et al*. (2006) and several others that unprotected sexual intercourse accounts for the highest mode of HIV transmission.

From the study, the unemployed patients ranked highest and for those employed, 40.5% had blue collar jobs and the remaining had white collar jobs. This distribution is in line with the educational qualification where the highest percentage had only Islamic education and the least percentage had tertiary education.

Majority of the patients (45.1%) had no income at all and 27.1% had an income of <₦20,000 which is approximately the value approved by the Federal Government as the minimum wage. AVERT (2009) reported that "the virus does not discriminate by age, race, gender, ethnicity, sexual orientation or socioeconomic status, everyone is susceptible". Infection rate in the sample covered all socioeconomic status and the high percentage of people with low socioeconomic status is as a result of the choice of hospital the research was carried out. It is a state government owned hospital whose patients are usually of the lower class because of the subsidized health care.

The study showed most patients had a household size of <6 (63.03%) while 33.8% had a size between 7 and 12 and 3.17% had a size of >12. Irrespective of household size, the impact of HIV/AIDS on a particular household will not lessen as the ability to support a family decreases with morbidity.

Financial burden in this study was of utmost importance. Only 38.03% of the patients in this study were financially responsible for themselves as the others were financially cared for by family members who could be within or outside the immediate household.

This showed that the burden of HIV was not only on those infected, but also on others, thereby further straining resources.

The CD4 count and blood chemistry tests were done on all patients. 52.5% had done it once within the reporting period, 43% twice, 4.2% thrice and 0.4% four times. The policy of the hospital in accordance with the 2010 guidelines on management of HIV/AIDs is to have a CD4 count done every 6 months and 3 months for stable adult and paediatric patients respectively. From this result, reasons for the low test rate could be that the guidelines were not followed as most patients should have had at least 2 tests done within the reporting period. The breakdown of the machine for a while, failure of patients to turn up for their tests and misplacement of test results contributed to the reported low test rates. Other laboratory tests included PCV, chest X-ray, full blood count, malaria parasite and Widal as well as Mantoux test. PCV was done to check anaemia which is a common side effect of zidovudine. TB was also seen as a co-morbidity necessitating the use of chest X-ray and Sputum AFB to aid diagnosis. Other tests were to aid diagnosis of OIs or to aid in proper management of the disease.

As regards treatment, 94.37% of the patients were on ARVs and 5.63% on co-trimoxazole prophylaxis only. The most prescribed ARV was lamivudine, zidovudine and nevirapine fixed dose combination. This could be because most of the patients were on first line and the gradual phasing out of stavudine due to its reported side effects of peripheral neuropathy, as of the time of the study.

From the study, 62.32% of the patients had never had an ER visit while 48.68% had had a visit. HIV/AIDS had been attributed with a high rate of morbidity with most occurring at the onset of disease management (Benson *et al*., 2009). Use of ARVs are supposed to decline the incidence of OIs but as reported by Benson *et al*. (2009)

decrease in OIs due to ARVs is only in the absence of drug resistant strains of HIV or due to multiple reasons which could include poor adherence, drug toxicities or drug interactions.

Most of the patients (87.68%) had never been hospitalised and 11.27% hospitalised once. Details as to the cause of hospitalization were unavailable. Hospitalization will also increase strain on resources to households, further increasing the burden especially if the "bread winner" is hospitalised. Also, as is the custom in most Nigerian hospitals, a family member will have to stay with the indisposed person thereby increasing costs.

From the study, HTN and TB were seen to be the most disturbing co-morbid illness. Others include eye disorders, pneumonia, peptic ulcer disease and diabetes. Benson *et al.* (2009) reported that OIs can range from mild infection to severe life threatening infections like TB and PCP.

Antimalarials, NSAIDS and paracetamol are associated with the highest use in self-medication in this study. This may not be unconnected with the fact that the study was carried out in a malaria endemic region-Nigeria, where antimalarials and analgesics are readily available as over the counter (OTC) medications.

Incidence of serious SE/ADR were not common as only 31(10.3%) of the patients had experienced at least one side effect from their ARV agents and of this, only 10 of them (32.26%) took medication to manage it. This could be because counselling is done at various points (doctors, nurses, pharmacist offices) on expected SEs and how to manage them non-pharmacologically and also some of them are self-limiting.

Access to health care services to individuals irrespective of HIV infection is important. 90.85% of the patients had access only to MMSH for HIV/AIDS clinic and dealt with

other illnesses as “out of pocket” expenses and only a small population (4.93%) had access to NHIS or retainer care with other hospitals. In Nigeria, NHIS, retainership or other health care arrangements is accessed mostly by white collar workers of which this study group are a small portion. Only 4.22% admitted to accessing traditional medicine which could be either purchased or obtained from the environment. The percentage using traditional medicine is low from the view that the WHO (2005) developed a policy on traditional medicine and the regulation of herbal products because of the increase in its use by member countries, including Nigeria.

Personnel involved in the study are doctors, pharmacists, nurses, pharmacy technicians, laboratory scientists as well as data entry clerks. Their average annual cost per patient was estimated to be ₦40,008. Their annual wages, hours of work, average time spent per patient as well as the total number of patients seen were put into consideration. Thus, this cost will vary from hospital to hospital. Professional bodies advocate cutting down the number of patients seen by health workers per day so as to increase quality of care. This study had an average number of patients per day to be 50 people, which is considered high. Nigeria has a doctor-patient ratio of 1:6,400 while the United States has 1:390 (Wikipedia, 2012)

Individual patients’ contribution to transport cost was evenly distributed and most resided within the state. The most costly transportations in this study were 32 total visits from Rogo in Kano state and 8 visits from two South Africans. Total transport cost of all the patients in this study (excluding cost of travel from South Africa to Nigeria) was calculated, and an average of ₦2,634 obtained. Average annual transport cost in diabetes management as reported by Suleiman *et al*. (2006) was ₦30,696.7 per patient which is much higher.

The CD4 count and blood chemistry tests contributed an average ₦9,148. This value could have been higher considering the breakdown of the machine during the period under consideration.

Other laboratory tests averaged ₦449 per patient. It would be worthy to note that some patients carry out tests on their own especially malaria parasite test and eventually procure antimalarials (if titres are significant) without the knowledge of the hospital and these are not included in this report. Suleiman *et al*. (2006) had an annual value of ₦56,400 per patient for diagnostic tests. This could be because of the frequency of random blood glucose tests.

The average cost of ARVs per patient was estimated to be ₦270,291. The use of FDCs resulted in a lowering of this cost. It should also be noted that were there more patients on second line regimen, this cost would have been higher as the first line regimen were cheaper. A study in South Africa (Connelly, 2001) reported the cost of ARVs to be between 70,000 and 80,000 Rand (₦1,116,666.67-₦1,333,333.33). The number of years past could also account for this difference as cost in Nigeria at that time was also high.

Average cost in management of OIs and other illneses grossed ₦1,208. Freedberg *et al*. (1998) reported that the cost effectiveness of prophylaxis against HIV/AIDS related OIs vary widely and in an era of limited resources, this money could be spent on exploring new alternatives to improving patient care. Hence, putting in measures to limit OIs would cut costs.

The average cost for managing co-morbid illnesses amounted to ₦521. The most contributing illness was HTN, TB and PUD. This value was lower than that reported in other literature for these illnesses. Olayinka (2011) calculated drug therapy of HTN in

males to be ₦1,590.2 and females to be ₦1,595.68 per month and Umar *et al.* (2011b) calculated TB drug therapy to be $30.89 (₦4,757.06) which is higher than the average cost of managing a co-morbid illness. Discrepancies could be due to other costs such as personnel cost, inpatient care etcetera included in the work of Umar *et al.* (2011b) as this study only considered outpatient drug therapy component.

The cost of managing SEs/ADR was estimated to be ₦109 per patient. SEs are well managed in HIV/AIDS care. At the onset of therapy patients are counselled as to the SEs expected as well as how to manage them (non pharmacologic). Pamphlets on managing ARV SEs are also available for the patients. All these account for this reasonable cost of managing the SEs.

The cost for drugs used in self-medication amounted to an average cost of ₦324. It should be noted that not all patients would recall their self-medication purchases hence this cost could be higher. Ogunsile (2012) did a study in which 70% of respondents practised self-medication and this was common among the adults.

Hospitalization accounted for a total of ₦45,500 and an average cost of ₦1,300 per patient. Most of the data for calculating this cost component was obtained from the patient as records were unavailable in the patients' folder. Stigma from health workers to HIV/AIDS patients necessitated the need for multiple folders for patients within a hospital. This of course results in incomplete patient records. Guinness *et al*. (2002), in a study in Kenya analysed hospital admission for HIV positive individuals. The mean length of stay was 9.3 days and a mean cost per patient admission of $163 (₦25,754) was calculated. There was no significant difference in costs or mean lengths stay between clinical AIDS patients and HIV-positive patients without AIDS.

The indirect cost component in this study was calculated using the average salary of each occupational cadre of patients. Only productivity losses by patients themselves from not going to work were carried out. Care givers losses were not calculated due to unavailability of data. The cost was estimated to be a total of ₦680,588 (1,218 days) and an average of ₦4,827 per patient. A South African sugar company reported that HIV positive employees took a total of 55 days off as sick leave in the last 2 years of their lives (Bill, 2005). East African businesses have also reported absenteeism as accounting for 25-54% of company costs (UNAIDS, 2003) showing effect of productivity loss on organisations.

Direct-medical costs to the health provider for the reporting period amounted to ₦323,303 per patient. This included the drug therapy and the personnel. The personnel who in this case were provided by the state Government contributed ₦40,008 per patient while the provider Non Governmental Organisation (NGO) responsible for the drug supply contributed ₦288,295 per patient (ARVs, OIs and laboratory tests combined).

The direct medical cost incurred by the patient was ₦3,055. This constituted 2.12% of their income (average monthly income was estimated to be ₦11,983 and ₦143,796 annually).

Direct non-medical costs amounted to ₦2,634 and the indirect cost ₦4,827, which constituted 1.83% and 3,36% of the patients income respectively.

Total direct and indirect costs to the patient made up 7.31% of patients' income. This figure is significant as sometimes more than one household member may be infected and also as applies to a number of those in the study, only one person earns significantly and the burden of housing, education, other health conditions and utility

bills may also be on him. Russell (2004), in his review estimated that about 7% of household income of Nigerians is attributed to direct and indirect costs of illness (2.7% for malaria).

Considering that costs were attributed to both the health sector and the patients, we can reject the null hypothesis. An alternative hypothesis would be that significant costs are attributed to both the health sector and the patients being managed for HIV/AIDS at MMSH, Kano.

CHAPTER SIX

6.1 Summary

HIV/AIDS burden to Nigeria and Nigerians cannot be undermined. HIV/AIDS cut across all ages and socio-demographic class. Females are more affected than males and the effect of this can be felt as women are the home keepers and in most cases care givers too.

The burden of HIV/AIDS on healthcare providers as well as on patients is significant. This burden can only increase as the rate of new infection increases at a steady rate and the availability of ARVs increases the life expectancy of the HIV positive individual this will increase the number of PLWHA.

The burden of HIV/AIDS is also increased by the presence of co-morbidities as well as non-medical direct costs and indirect cost.

The study also showed that most HIV/AIDS patients have their resources already strained (as also reported by WHO, 2009) and may never be able to sustain additional costs of paying for the drugs or consultations themselves.

6.2 Conclusion

HIV/AIDS management is expensive both to the provider and to the patient. The NGOs have not been able to reach their targets of having all HIV positive eligible patients on therapy and the Government of Nigeria should think of putting in funds to augment the efforts of the donors.

More awareness on prevention may be a cheaper stance for the Government to take so as to decrease overall burden of the disease.

6.3 Recommendations

Hastening expansion of HIV/AIDS treatment, prevention and care by decentralization of services and moving them to primary facilities as well as communities may be the key to decreasing overall disease burden in the long run. This will improve awareness on HIV/AIDS in all nook and crannies thereby decreasing incidence of new infections as well as decrease costs such as transport, indirect costs like hospital waiting time, absenteeism from work (because of less patients) and improvement in patient care as the number of patients per clinic day would be decreased. This may also decrease the incidences of OIs and self-medication.

A need for the full documentation of all visits and consultations would ease further studies as well as improve study outcome.

Consolidation of healthcare could be done; this could be by improving on the NHIS or alternative health insurance packages and expanding it to include HIV/AIDS management and redesigning the scheme such that both blue collar and white collar workers benefit from the scheme.

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APPENDIX

COST OF HIV/AIDS PATIENTS' QUESTIONNAIRE

FORM FOR RETROSPECTIVE DATA

Bio data

1. File No
2. Age
3. Sex
4. Address

   _____

5. Highest Educational level:

   Islamic education ( ) Tertiary ( )

   Primary level ( ) None ( )

   Secondary school ( )

6. Marital status:

   Single ( ) Divorced ( )

   Married ( ) Widowed ( )

7. Occupation:

   Unemployed ( ) Business ( )

   Housewife ( ) Trader ( )

   Civil servant ( ) Professional ( )

   Retired( ) Other (specify) _____

8. Average earnings per month: _____
9. Number of dependents: _____
10. Household size: _____
11. Sponsor: _____
12. Occupation of sponsor: _____
13. Average earnings of sponsor: _____

Medical history

14. Date of diagnosis: _____
15. Age at diagnosis: _____
16. Category: ART ( ) Co-trimoxazole ( ).
17. Date of commencement of drugs: _____
18. CD4 values:

_____ _____

_____ _____

_____ _____

19. Category of ART drugs:

Drug Regimen	Presentation	Dosage
Lamivudine/Zidovudine/Nevirapine		
Lamivudine/Stavudine/Nevirapine		
Lamivudine/Zidovudine/Efavirenz		
Lamivudine/stavudine/Nevirapine		
Cotrimoxazole		
Emtricitabine/Tenofovir/Nevirapine		
Emtricitabine/Tenofovir/Lopinavir+Ritonavir		

20. Opportunistic infection regimen

Drug Regimen	Presentation	Dosage/Frequency	Duration

21. Frequency of emergency room visits: _____

22. Hospitalisation:

    i. Frequency of hospitalisation: _____
    ii. Duration of hospitalisation and hospital costs

Hospitalisation	Adm. charges(₦)	Drugs and consumables administered	Drugs and consumables costs(₦)	Other costs(₦)	Overall costs(₦)

23. Co-morbid illness(es): _____, _____, _____

Drugs used

Drug	Dosage	Frequency	Duration	Overall cost(₦)

24. Self medication/ patent medicine drugs procured:

Drug	Dosage	Frequency	Duration	Overall cost(₦)

25. Frequency of absenteeism from work, school or other responsibilities: _____
26. Side effects / Adverse drug reactions: Yes ( ) No ( )
27. Were drugs used in correcting the ADR: Yes ( ) No ( )

28. If yes, list drugs:

Drug	Dosage	Frequency	Duration	Overall cost (₦)

29. Frequency of CD4 and chemistry tests: _____
30. Other diagnostic tests: _____

_____

_____

_____

_____

COST OF HIV/AIDS: HEALTH CARE PROFESSIONAL

QUESTIONAIRE

1. Age:
2. Gender: Male ( ) Female ( )
3. Profession:

   Medical Doctor ( ) Nurses ( )

   Pharmacist ( ) Laboratory Scientists ( )

   Others..... ( )

4. Grade Level: _____

Indicate answer where applicable to your field:

5. Average number of patients seen in a day: _____
6. Number of clinics per week: _____
7. Frequency of request for routine CD4 and chemistry tests: _____
8. Average number of patients counselled in a day? _____

CALCULATIONS; FORMULA

1. Sample Size Calculation:

   For population size less than 10,000:

   $n = \frac{Z^2 Pq}{d^2}$

   where n = desired sample size (when population is >10,000)

   z =2 (normal standard deviate)

p = population of target popn. Estimated to have a particular disease (prevalence used-3.2%)

q = 1.0 - P (0.968)

d = degree of accuracy desired (0.02)

$$n = \frac{(2)^2 \times 0.032 \times 0.968}{(0.02)^2}$$

n = 309.76

$$Nf = \frac{n}{1 + \frac{(n)}{(N)}}$$

Where Nf = the desired sample size when population is less than 10,000

n = the desired sample size when population is greater than 10,000

N = the estimated population size.

$$Nf = \frac{309.76}{1 + \frac{309.76}{3,333}}$$

= 283.42

Approx 284

Paed Patients = 283.42 x 9.48% = 27.89===28

Adult patients = 283.42 x 90.16 = 256

	No. of Patients	% Male	No. of Patients (M)	No of Patients (F)
Adults	256	31.98	82	174
Paediatrics	28	53.05	15	13

2. Cost for Health care personnel:Mean Salary per Minute = Annual Salary/ hours per week x Number of weeks per annum x 60