Sero-prevalence and Factors Associated with HIV and HBV Infection in Patients Attending Juba Teaching Hospital, Southern Sudan

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DECLARATION

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

Signature…… Date ……

Johnson Mayik Akol

This thesis has been presented for examination with our approval as university supervisors.

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DEDICATION

This Thesis is dedicated to HIV/AIDS Directorate of the Ministry of Health Government of South Sudan for the collaboration and cooperation they showed also in making this thesis a success, who are also the main beneficiary of the information produced. This thesis is also dedicated to the Expanded Immunization Program in the Ministry of Health, government of South Sudan to my daughter Tagi who was born in the course of the study.

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God bless you all abundantly.

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LIST OF ABBREVIATIONS AND ACRONYMS

CDC	Center for Disease Control
CI	Confidence Interval
HBV	Hepatitis B Virus
HIV/AIDS	Human Immune deficiency virus/Acquired Immunodeficiency Syndrome
IRB	Institute Review Board
JKUAT	Jomo Kenyatta University for Agriculture and Technology
OR	Odds Ratio
PLWA	People Living With AIDS
SSA	Sub-Sahara Africa
SSAC	South Sudan AIDS Commission
STDs	Sexually Transmitted Diseases
USAID	United State Agency for International Development
VCT	Voluntary Counseling and Testing
WHO	World Health Organization
UTI	Urinary Tract Infection

ELISA Enzyme Linked Immuno- sorbent Assay

FDA Food and Drugs Administration

ABSTRACT

HIV/AIDS and Hepatitis B Virus (HBV) are among the major causes of morbidity and mortality worldwide, with HIV affecting approximately 40.3 million people worldwide. Sub-Sahara Africa bears the greatest burden for both HIV and HB Virus in the world HIV prevalence ranges between 1.7% to 5.5% in northern Africa and from 5.5% to 9.5% in the sub Sahara Africa. HBV infections also ranges from 3%-5% in northern Africa to 10%-20% in sub Sahara Africa. A cross-sectional study was used to determine the prevalence and associated factors for HBV and HIV in south Sudan. About 251 participants were recruited consented. Then data was collected using semi-structure questionnaires and Epi-Info version 3.4.3 was used for data analysis. The overall sero-prevalence of HIV was 23% and 15% for HBV. HIV sero-prevalence was highest among females in the age groups of 30-34 years and 35-39 years. HBV sero-prevalence was highest among males aged below 15 years. The risk factors for HIV were being over 30 years of age, alcohol consumption and not-using of condoms during sexual intercourse. The protective factors for HIV were being circumcised, being single which indicate abstinence from sexual activity. No risk or protective factors for HBV were established. There is also need for targeted intervention programs among the population at risk for HIV. Also introduction of HBV vaccination in the Expanded Immunization Program (EPI) in southern Sudan for children <15 years, pregnant mothers, school children, health workers is vitally essential to the reduction of HBV incidence in southern Sudan.

CHAPTER ONE

INTRODUCTION

1.0 Background information

HIV/AIDS and Hepatitis B Virus (HBV) are among the major causes of morbidity and mortality worldwide. Globally the population infected with HIV is estimated at about 33 million people with annual death of about 2 million (UNAIDS, 2008). Sub-Sahara Africa is estimated to bears a disproportionate share of the burden of HIV/AIDS and Hepatitis against it population size which makes up only 10% of the world population. hence 67% are reported infected with HIV/AIDS (UNAID;) Among the same population, it is estimated that 70%-90% had shown evident of past infection with Hepatitis B virus. Currently 67 people are in Sub-Sahara. The carrier rate of HBV ranges from 3%-5% in the north of the Africa continent in comparison to 10%-20% in the sub Sahara Africa. HIV prevalence on the same scale is also reported to increase from 1.7% in the northern part of the African continent to 5.5% in the sub Sahara Africa (; 2005). It is estimated that, in Sub Sahara Africa, 15.4 million (50%) of HIV-infected adults were women in 2008 (UNAIDS, 2008) and most of them had contracted HIV through sexual transmission from their stable partners (Tabi *et al.,* 2003). In Sub Sahara poverty and Economic hardship is acknowledged to compound women's sexual vulnerability (Carael & Allen, 1995; Ulin *et al.,* 1992), which however is associated with early onset of sexual activity, pre and extramarital sex, and multiple sexual partnerships, all of which have serious implications for the spread of HIV/AIDS in the African continent.

In Sub-Saharan Africa, HIV/AIDS and Hepatitis B are rooted in the socio-cultural, economical makeup of the African continent. Poverty is eminent in sub Sahara Africa it's considered one of the drivers which have fuelled and propelled the epidemic in the region. Nevertheless the scarcity of financial resources, knowledge

and skills to fight HIV/AIDS worsen the already existing situation. HIV prevalence has already gone high in many African countries. But in contrary to others, many African countries havedemonstrated showed low prevalence of HIV/AIDS (Kaiser *et al.,* 2002) Spiegel PB *et al* 2007). Many factors are believed to have kept HIV prevalence in many countries is lower than in others. Among them is conflict which is presumed to have kept the prevalence of HIV in many conflicted area lower than expected due either to immobility or lesser interaction between populations in the conflicted zones.

As HIV/AIDS epidemic curve was dropping in many African, Hepatitis B prevalence remained stable in many countries affecting mainly children at the early stages. Unlike Hepatitis B which is reported at the early childhood, HIV prevalence is generally reported high between the age 15-24 year in countries like Kenya, Uganda and South Africa among others (Simon *et al.,* 2006). Females at the reproductive age are reported to have the highest prevalence of HIV rate in African continent (KAIS, 2007).

Nevertheless the international community on disease prevention program has doubled their effort in prevention and control o HIV/AIDS and HBV since the reporting of the first HIV patient in 1981. The question is 'are the people in Sub-Sahara Africa doing enough to reduce the burden of HIV epidemic? Or is what is being done is done is the right way? In answering these questions lies the fact whether the epidemic in the Sub-Sahara Africa will come to a halt. HIV/AIDS however will keep rising in Sub Saharan Africa countries unless potential efforts are

put in place to counteract the potential increase in the incidence of o the epidemic. Therefore the need for good surveillance system to monitor the prevalence of HIV/AIDS or Hepatitis B in Sub Sahara Africa is imperative to change in change in health system services delivery and effective planning.

For the last quarter of the 21st century, HIV/AIDS has been subject to multiple research from many scientists to understand the mystery the lies behind the possibility of HIV cure. Using leading age technological instruments and devices to probe and understand the nature and constituents of HIV genome . Scientists were puzzled by unique and distinct behavior shown by HIV which was not known in the history of medicine. This however has casted many questions as to the future of the epidemic in relation to the impact and consequences in the year to come.

Sudan had been severely involved in conflict for almost two decades. Since the isolation of the HIV for the first time in 1983 upto date, HIV/AIDS have been reported on the daily basis but there was no mass response to quantify the size and the magnitude the epidemic. But looking into the history of subclinical nature of HIV infection which could possibly last decades or more, HIV infection would almost date back to years before its isolation in 1981. It is possible that HIV is not a new disease in the history of mankind.

HIV/AIDS services in South Sudan are not effective enough to contend the spread of the epidemic. Hepatitis B immunization policies are lacking, health system infrastructure is still fragile, and manpower is insufficient to cover the entire Southern Sudan. Effort made by semi autonomous government to improve HIV

services and HBV immunization programs to the target population are still in their infancy. The uptake of screening tests for HIV and HBV in South Sudan is poor despite the availability of HIV screening tests. Massive challenges remain in health sector. The assumption that HIV/AIDS and HBV prevalence is high among the population cannot be verified. Limited data reveals the existence of HIV and Hepatitis B, but the extent is unknown. Incidence rate and prevalence of HIV is not yet determined. Drivers for the epidemics have been identified to be associated risk factors related to social dynamics, cultural, behavioral practices traditional practices economic constraints and developmental issues. Poverty, inadequate control measures (HIV) unavailability of vaccination and vaccination policy (HBV), remain as challenge and the intervention to counteract increasing prevalence of HIV and HBV is a big challenge to the health sector in south Sudan.

1.1 Background study of Human Immune Deficiency (HIV) and Hepatitis B virus

Human immunodeficiency viruses and Hepatitis B virus cause clinical syndromes known as the Acquired Immune Deficiency Syndrome (AIDS) and liver cirrhosis or hepatocellular carcinoma respectively. Both viruses share some common traits and characteristics that give different clinical manifestations such as sub-clinical infections. They are also mainly transmitted through blood transfusion, sexual contact, or contact with contaminated surgical instruments or body fluids of infected persons.

Human immunodeficiency virus (HIV) and Hepatitis B virus HBV are among the latent infections that can cause lifelong chronic infections with sequelae, disabilities that remain with victims throughout lifespan of the victim if do not result in immediate death. Hepatitis B virus causes serious complications viral hepatitis, liver cirrhosis and hepatocellular carcinoma as well as neonatal and infants chronic infections (McMahon *et al.,* 2005). The mode of their transmission however is multiple and varied due to many factors that are associated with their continuous transmission.

And because most of the infections with HIV and Hepatitis B virus are associated with urban life, they are considered as modern age infectious diseases. In considering many cultural and socioeconomic factors that accelerate the transmission in the urban population, until recently as reported the determinants Sub-Saharan Africa is the mainstay of the epidemic. The main causes of the epidemic are rooted in, conflict trauma, poverty, polygamy, commercial sex, refugees, migration, illiteracy and poor health system. However concerted efforts to control and eradicate (HIV/HBV) in terms of finances, health partnership and collaboration. Delayed development in the infrastructures and poor performance of the health system creates concerns about possible HIV prevention, mitigation, care and treatment and the sustainability in the face of limitations.

1.1.1 Transmission of HBV and HIV

Understanding the disease spread and distribution has been the subject of many studies in the recent years. These studies however have focused on understanding how diseases spread in the communities. These types of studies have helped in designing vaccination policies and prevention guidelines in disease control programs. Sexual contact has been identified as the main route of HIV and HBV transmission of both infections though there are also several other important routes and modes of transmission.

Today, rapid development of fast modes of travel have changed human habits towards many diseases that just a few years ago would have been of a local concern but now are a global threat and are of international public health concern . HBV and HIV infections occur within the unique context of sexual encounters, and the network of contacts is a critical ingredient in continuous transmission (Simon *et al.*, 2006). However, HIV unlike HBV is transmitted in many ways despite the virus instability outside human body. Unlike HIV and HBV is mainly sexually transmitted and the viability of the organism outside the human body has not been demonstrated. However, during the lifetime sexual activity of the individual is likely to change due to sexual behavior as a result of changes in age, residence, marital status, age-linked sexual attitudes, etc but it has been observed that even among people of low behavior to the risk of HIV is increasing among old age and children alike (Bhavan *et al*., 2008). Vulnerability of the majority of population in South Sudan is a significant issue in changing human behavior to modify the risky behavior. Human

right issues and the extreme problem of development, poverty, and poor functioning health system and gender exploitation are derailing efforts of HIV prevention and eradication.

1.2 Conflict and HIV/HBV spread in Africa

Africa is the most affected continent by conflicts worldwide. The current estimated numbers of refugees and internally displaced persons (IDPs) worldwide are between 12 and 25 million (Massimo *et al.,* 2005). The needs of many displaced people in Africa are enormous due to the trauma they have suffered and the deplorable conditions in which they live. Furthermore, their vulnerabilities are increased due to destitution, displacement, discrimination and reduction of basic services and coping mechanisms as a result of conflict or any other unrest in the region. South Sudan is one of the affected regions in Sub Sahara Africa by conflict so far.

Before the comprehensive peace agreement (CPA) endorsement in Naivasha Kenya, many Southern Sudanese were in the refugee camps along the borders of the neighboring countries (Spiegel *et al.,* 2004). The environment in refugee camps was conducive to the transmission of many infectious diseases in as for 1998. But when the comprehensive peace Agreement was signed many refugees and displaced people returned home from the diasporas.

Post conflict period in south Sudan has attracted different type of businesses such as commercial sex workers indulging in other risky behaviors in the quest of employment and shelter. This has increased the risk of HIV infections in South

Sudan. Nevertheless significant challenges lie ahead from displaced people who were living in countries with high prevalence of HIV/AIDS. It has been documented that conflict in most of African countries has appeared as a protective factor in HIV transmission. This could be observe why several African countries which were conflict zone has shown low prevalence of HIV throughout the conflict period (Kaiser *et al*., 2002).In contrary to that post conflict period may come with an environment that may be more conducive to HIV transmission as a result of increased interaction among population and increased mobility. However post conflict period in Southern Sudan is observed as a period with increased repatriation of the refugees and peoples in diasporas to come back home to their country of origin. This also is seen as forthcoming challenges in HIV transmission in HIV transmission in Southern Sudan (Spiegel *et al.,* 2007).

On the other hand conflict in South Sudan has also contributed to the spread and transmission of HIV in another way. During the two decades of war in South Sudan there were no proper functioning health systems in place. The health system was vulnerable due to the lack of financial resources and skills to implement the control measures to contend the spread of HIV/AIDS and other infectious diseases. However , war has been looked at to slow down the spread of and transmission of HIV/AIDS in many remote areas in Southern Sudan (Kaiser *et al.,* 2006; Spiegel *et al.,* 2007).

But in accordance to the data collected on daily basis, many towns around the border of South Sudan have shown rising numbers of HIV infected people in population.

Contrary to that this has been associated with economic stresses associated like low wages, unemployment, and increasing poverty presumably inclination of many women to use sex to generate income for basic their needs. This however provokes early initiation of sexual activity among young girls and high incidence of multiple sexual partnerships (Oberai, 1993; Habitat, 1996; White, 1996; Brinkerhoff & Brennan, 1998; Todaro, 1989). This is however indicative that HIV transmission occurred more in towns than in rural areas. But due to difficult living conditions, women sometimes have limited economic options for survival rather exchanging sex to obtain money to cater to their basic needs and of their families (Zulu, Dodoo, 2002 & Zulu *et al.*, 2003). On the other hand and due to the high demand for money in poor families, these conditions also prompt men to exploit women's economic vulnerability by paying very little for sex and subjecting them to subsequent sexual activities with several men, sexual exploitation and domestic violence (Oppong, 1995; Ezeh & Gage, 2000).

Money however is central to existence in cities where difficult economic circumstances force women to use sex as a means of survival in urban than in rural areas. Nevertheless unpublished data has shown that as you move to the center provinces of Southern Sudan the prevalence of HIV/AIDS and Hepatitis B decreases gradually.

As the number of infected people (people living with HIV) increased in Southern Sudan according to PLWA association and the demands for increased measures of prevention are needed desperately and the unknown magnitude of HIV/AIDS remains a challenge. There is no sero-prevalence data to show the percentage of

infected people and the rate of HIV infection within special settings and communities like mother to child transmission (PMTCT) which also involve prevention of sexual transmission of HIV within married couples, HIV testing for each member and the systematic use of condoms if one of the members is HIV-positive because HIV/AIDS infections are believed be spreading faster than ever among married couples that in single individual (CDC, 2008). Therefore to contend with the rapid spread of HIVAIDS, data on prevalence and incidence are crucial in formulating interventions in south Sudan.

1.3 Statement of the study problem

Since the estimated rates of HIV are becoming crucial in HIV/AIDS response policy, the need for data are becoming imperative in HIV/AIDS management for health centers, hospital regional ministries of health and World Health Organization for formulation of health policies, availing financial resources and raising the alarm for emergency intervention. Since there is no population based estimates have been done in South Sudan in the years that followed that report of the first case, the availability of information at this time to counteract assumed HIV increasing incidence and prevalence is inadequate.

But many reports suggest that HBV infection is doubling each year. Report by Southern Sudan AIDS council in 2006 showed HIV/AIDS prevalence of 3.1% (SSAC, 2006) .Two years later United states center for disease control conducted a sentinel site survey on a selected site under their sponsorship which revealed prevalence of 3.7% (CDC, 2008).

This data however lacks validity due to lack of generalization, since it not a population base study which determines HIV/AIDS and HBV prevalence on a larger scale. But evidence from daily collected data shows that HIV/AIDS and HBV exist in Southern Sudan. Therefore factors that contribute to the spread of both HIV and Hepatitis B in the South Sudan have to be determined and identified. According to world health organization any country which exceeds the prevalence of 8% is considered hyper endemic for Hepatitis (WHO, 1996; 2007). This study investigated the prevalence and sero-epidemiology of HIV/AIDS and Hepatitis B and associated risk factors among the selected population in Southern Sudan.

1.4 Justification of the study

Southern Sudan has been affected by HIV/AIDS like the other Sub-Sahara Africa countries (Spiegel *et al.,* 2007*).* However, the extent of the problem is not yet known largely because of the long standing civil war in the area. During that time, no health-care was properly functioning in south Sudan to monitor and evaluate the escalating rate of HIV/AIDS and HBV infections. Because of the high mobility of soldiers during the war-time, poor health systems and the return of refugees from the displaced camps in the diaspora, Southern Sudan is vulnerable to the devastating effects of HIV and HBV infections and there have been reports of increasing infections. This increasing trend will pose a potential serious threat to national and international health security. This threat however can be reduced by monitoring HIV and HBV sero-prevalence, determining risk factors, and behaviors associated with increasing HIV and HBV rates in the country.

The civil war has resulted in a fragile health system, poor service delivery and rapid spread of HIV and other diseases among the population of Sudan in general and South Sudan in particular (Hankins *et al.,* 2006). Human immunodeficiency virus (HIV) and Hepatitis B virus (HBV) can exist at sub-clinical state for long periods of time without attendant opportunistic infections, liver cirrhosis, neonatal conjunctivitis, hepatocellular carcinoma, infertility, and other severe complications (Maynard *et al*., 1989). It therefore, follows that early diagnosis and screening for these infections will lead to better management of HIV/AIDS and Hepatitis B virus. Assessment of the extent and risk posed by these blood-borne infections in South Sudan will facilitate decision making on how to prevent further spread of these infectious diseases and provide appropriate care to infected persons. This study aims at providing baseline information on HIV and HBV prevalence in South Sudan which will facilitate the allocation of resources, provision of medical services, monitoring and evaluation efficiency and effectiveness of activities and programs directed at the prevention of HIV/AIDS and Hepatitis B virus in the context of Ministry of health Southern Sudan Government.

1.5 Hypotheses

1.5.1 Research Question

What is the seroprevalence and factors associated with HIV and Hepatitis B among patients attending Juba teaching hospital in Southern Sudan?

1.5.2 Null Hypothesis

HIV/AIDS and Hepatitis B sero-prevalence is low in Southern Sudan with no modifiable risk factors

1.5.2 Alternative Hypothesis

HIV /AIDS and Hepatitis B sero-prevalence is high in Southern Sudan and is associated with modifiable risk factors

1.6 Objectives

1.6.1 General Objective

To determine sero-prevalence and associated factors for HBV and HIV infection among patients attending the Juba Teaching Hospital South Sudan, Juba, 2009.

1.6.2 Specific objectives

1. To determine the sero-prevalence of HIV and HBV in patients attending the Juba Teaching hospital.
2. To determine associated factors of HIV/HBV infection in patients attending the Juba Teaching Hospital.

CHAPTER TWO

LITERATURE REVIEW

2.1 Global estimates of HIV/AIDS

It has been estimated that more than 33 million people are living with HIV/AIDS worldwide with annual death rate exceeding 2 % in 2005 (UNAIDS, 2008). Although deaths from infectious diseases will decrease throughout epidemiological transition period, the overall, HIV/AIDS deaths will still continue to increase; though the exact magnitude of the increase will depend entirely on how many people will have access to antiretroviral drugs and the efficacy of prevention programs but it is estimated to be one of the leading disease burden by 2030 after uni-polar depressive disorder and ischemic heart disease.

2.1.1 Global Prevalence of HIV /AIDS

Several studies on prevalence of HIV and HBV carried out in different countries have shown varied result. These differences go back to variation in respective populations under study, in addition to the performance of the health systems in terms of how well the control and prevention programs are implemented in the respective countries. It is estimated that the total morbidity of HIV/AIDS worldwide is 40.3 million people According to the global estimates; According Mather & Loncar it is projected that by the end of 2030, HIV/AIDS mortality rate will raise from 2.8 % to 6.9% (Mathers & Loncar, 2006). This will rank HIV/AIDS among the highest morbidity diseases of the twenty first century with Sub Sahara Africa being the leading region in terms of number of infected population.

Studies carried out in United Kingdom showed prevalence of HIV of 0.4% and HBV of 8.0 % in 2000 respectively (Weild *et al.,* 2000). A population based study carried out in Brazil indicated slightly elevated results of (HIV 3.2%, HBV 17.5%) (Catalan *et al.,* 2000). A general population study in United States of America showed prevalence of 25.2% for HBV (Solomon *et al.,* 2004). Again in comparison to other population based studies in the general public mainly among healthy blood donors and pregnant women in Ghana showed variation in seroprevalence rates of 4.9% for HIV and 11.7% for HBV in contrast to other studies done among Ghanaians (Adjei *et al.,* 2008b). Other Sero-epidemiological studies of HBV_S Ag carrier rate in Italy showed a prevalence of 6.7% (Chiaramonte *et al.,* 1982). 13.3%) prevalence of HBV was found among prisoners in Greece (Chatziarsenis *et al.,* 1999). Therefore variation in the Sero epidemiology of HBV and HIV in different countries has varied results in prevalence. This however can be attributed to factors such as: settings, ethnic group, cultural and socioeconomic factors, and type of population and accessibility of health services in the country in the respective country. In many instances situation may favorable for HIV and HBV in many communities than in others because preventive or promotive factors are modified by human behavoiur which simply creates conducive environment for the transmission HIV and Hepatitis B with communities.

Despite efforts by US government in term of finances, strategies and approaches, HIV/AIDS prevalence is reported to be increasing in the United States (more than 15%) (CDC, 2005) among the old age and there is no clear explanation as to whether this increase is a result of sexual activity or due to other factors like aging

of HIV-positive persons or any unexplored method of transmission. Whatsoever may be the case, this is a clear alarm about the possible challenges that HIV pandemic poses. Therefore the present control activities could not contain or reduce the HIV incidence among older people as well as young people alike even in a country like United State of America. This however should invite more research in HIV/AIDS to find new innovative strategies for the eradication.

2.1.2 Regional prevalence of HIV/AIDS

Sub Sahara is the most affected area globally and regionally by HIV/AIDS and other infectious diseases. There is no clear reason why Sub Sahara Africa is considered as the most affected area. What comes out clearly is that it also the most unexplored area which has been in conflict for the last 50 years on the globe. Literacy rate is low and poverty rate is high due to exploited resources, bad governance which is imminent throughout the region. Populations in Sub Saharan Africa are not only economically deprived but also lack skills and knowledge to run the government institution to guarantee good service delivery in South Sudan.

However HIV/AIDS was documented early in many African countries Uganda for example has been struck by HIV epidemic in early 1990s and HIV/AIDS prevalence today in Uganda is 6.7% while the prevalence of HIV/AIDS dropped in northern Uganda from 27% to 11% from 1993 to 2003 (Spiegel *et al.,* 2007) . However, according to the literature, Uganda is quoted as a nation that has succeeded in reducing the prevalence of HIV/AIDS from different settings (UNAIDS, 2004). For example HIV prevalence among pregnant women in Kampala fell from 31% to 6.2% between 1990 and 2003, (UNAIDS/WHO, 2005*)* while among army recruits

aged 18 to 21 years, prevalence rates decreased by 12% over 5 years (ICMH, 1997). This is attributed either to death of the infected person or effective prevention measures which were launched in the early 1990s.

Kenya is also experiencing an increasing prevalence 7.4% on population base information taken from Kenya AIDS indicator survey (KAIS, 2007) with the highest prevalence in western region of Nyanza estimated at 15% in general population.

In Ethiopia data on HIV prevalence is limited to VCT data. But there seems to be a large variation in HIV epidemic throughout the country .In Addis Ababa the prevalence is 14.6% in the urban population. While in the rural areas prevalence is 11.8% **(**Fontanet *et al.*, 1998). Studies conducted in Ghana among prison inmates also revealed Sero-prevalence rates of HIV as 5.9% and HBV as 25.5% out of 1336 people sampled *(*Adjei *et al.,* 2008b). There are no studies documented in south Sudan on HIV prevalence because the country was occupied for almost two decade conflict that ended in with comprehensive peace agreement in 2005 signed in Naivasha Kenya. Surrounded by many countries with high prevalence of HIV and with continues pouring of refugees, business men to Southern Sudan will however has raised the concern of many as this may increase the magnitude of HIV and HBV in Southern Sudan

2.2 HIV/AIDS burden in Sub Sahara Africa

Sub-Saharan Africa is home to approximately 10% of the world population with low gross income per capita. Many people in this region live below the world poverty line of one dollar a day (UNAIDS, 2007). Therefore in the face of lack of basic human needs, human beings are vulnerable to indulge into risky behavior such as

unprotected sex, commercial sex in order to provide their daily needs. It is estimated that the total morbidity of HIV/AIDS worldwide is 33 million people. It is estimated that 67% of these are in Sub–Sahara Africa (UNAIDS, 2008). In addition, more than 14000 people are infected daily with HIV. According to the global estimates, it is projected that by the end of 2030 HIV/AIDS mortality rate will rise from 2.8 % to 6.9% (Mathers & Loncar, 2006) which will put HIV/AIDS among the highest morbidity diseases of the twenty first century.

HIV burden in Sub-Saharan African countries remains a great challenge not only as a result of limited resources that are allocated for control and prevention, but also as a result of lack of appropriate knowledge, assets, skills and innovative approaches in public health measures. Also external factors such as conflicts in the region, instability of governments, poverty, risky cultural practices such as polygamy, unprotected sex (Cohen *et al,* 1998) due to unacceptability of condom use, continuous migration, commercial sex and break-down in public health measures continue to fuel the HIV epidemic especially in the last quarter of the last century within Africa.

The history of HIV in Sub-Saharan Africa has always been associated with STDs and other sexually transmitted diseases such as the Hepatitis B virus. The mean percentage for HBV endemic areas in Africa is approximately 10.5% (Viviani *et al*., 1999; Lavanchy *et al*., 2004).

2.3 Prevalence of HIV/AIDS in south Sudan

Sudan is the largest country in Africa and has been affected by conflict for more than two decades. Immediately following the comprehensive peace agreement in 2005, Southern Sudan AIDS commission (SSAC) was formed in 2006 to tackle issues of HIV/AIDS affairs in Southern Sudan. In 2007, Southern Sudan AIDS commission (SSAC) was able to estimate in conjunction with ministry of health government of Southern Sudan the prevalence of HIV/AIDS among pregnant women in antenatal clinics to be 3.1% (SSAC, 2006). Meanwhile, a sentinel study of HIV/AIDS conducted by CDC at a small number of facilities between 2005 and 2007 in Southern Sudan reported a prevalence of 3.7% (UNAIDS, 2008).

Despite this however, little is known about the HBV, HIV-1 Sero-epidemiology and the associated factors in Southern Sudan. The only available data are syndrome-based data indicating that HIV and HBV are among the most common causes of illness in Southern Sudan. Any therapeutic treatment is done on the basis of scientific syndromes assumption, however clinical evidence shows increase in number of patient reporting to STI clinic with acute urinary tract infection. This therefore, forms the basis for a study of co-infection between HIV and HBV in Southern Sudan in order to support the current polices intervention.

2.4 Pathology of HIV/AIDS

HIV (human immunodeficiency virus) infects and destroys the immune system, leaving infected individuals susceptible to other infectious diseases and tumors (Jorg *et al*., 2007). Clinically HIV infection is divided into stages: Primary HIV infection

lasts a few weeks and often involves a flu-like illness. During this stage, the immune system begins to respond to HIV by producing antibodies. The time needed for these antibodies to appear on testing "Sero-conversion" (usually 6–12 weeks) is called the window period; HIV antibody tests done during this period give false negative results. During the second, symptom-free stage of HIV infection, which can last many years, the virus gradually destroys the immune system so that by the third stage of infection unusual infections begin to occur. The fourth stage AIDS (acquired immunodeficiency syndrome) is characterized by multiple AIDS-indicator conditions such as severe bacterial, fungal, or viral infections, and cancers such as Kaposi sarcoma.

2.5. Global burden of hepatitis B virus

Hepatitis B virus is a global health problem with annual death estimated at more than 500,000 peoples (Maddrey, 2000; Lee, 1997) and more than 400 million people are being infected each year. 400 million of who are chronic carriers (Lee *et el*., 1997). The outcome of acute hepatitis B virus infection ranges from asymptomatic sub-clinical infection (70%) and symptomatic acute hepatitis (30%) to fulminant hepatic failure (0.1-0.5%) (Mahoney *et al*., 1999; Tassopoulos *et al*., 1987). The chronic carriers of HBV worldwide are estimated at about 15-40 % (Liaw *et al.,* 1988) of the total infections (Yang *et al.,* 2008). Most of the chronic cases develop liver cirrhosis or hepatocellular carcinoma (Abe *et al*., 1999). It is estimated that about 80% of the global hepatocellular carcinoma results from Hepatitis B virus infection that goes untreated. HBV has a long incubation period which lasts for

decades with no clear symptoms. With liver cirrhosis and hepatocellular carcinoma as end points of long time infection it has become necessary to screen for chronic hepatitis to prevent the adverse outcomes.

In the mid 1990s, there was reduction of HBV among sexually active men and women of reproductive age. This however was not due to HBV vaccination, but to the behavioral changes resulting from condom use (Chen *et al., 1996).* Other risk groups such as intravenous drug users and homosexual men who do not use condoms and safe needles respectively remain a threat to public health.

Hepatitis B virus affects people of different age categories 95% in children and 2-10% in adults causing severe or chronic viral hepatitis (Hermann *et al*., 1999). Majority of the infections occur at birth and about 90% of population infected are infant (Gust et *al.*, 1986) infected adult mothers are the major risk factor for infant infection. The most common source of infection with Hepatitis B virus is adult chronic carrier either through sexual contact or at the delivery. Therefore as the rate of hepatitis B virus infection decreases among children as a result of vaccination, chronic adult carriers of HBV will still be potential risk factor for Hepatitis B transmission. Therefore determining the risk factors and screening mothers of reproductive age is an essential step in the Hepatitis B eradication.

2.5.1Regional prevalence of Hepatitis B genotype

Africa is one of the highly endemic regions for HBV, with 5 genotypes A-E identified. Genotype A in Kenya (Usuda *et al.,* 1999) genotype D in Tunisia (Borchani *et al*., 2000) genotype A-D in South Africa (Bowyer *et al.,* 1997) and

genotype E in Nigeria (Odemuyiwa *et al.,* 1997). The mean prevalence of chronic HBV infection in Africa is 10.4% (Lavanchy, 2004; Kew, *1996*). The reported prevalence varies among the reported predominant genotypes in these countries. However the mean prevalence of Hepatitis B surface antigen is 10.3% in Sub Sahara Africa with the general carrier rate ranging from 9-20% (Viviani *et al.*, 1999).

2.5.2 Hepatitis B virus (HBV) prevalence in Sudan

HB prevalence among pregnant women who attend antenatal clinic in Sudan is approximately (5.6%) (Rasha *et al.,* 2007).These are considered as asymptomatic carriers of HBV. However this does not include Southern Sudan and the data of Hepatitis B in Southern Sudan is still missing.

2.5.2.1. Pathology and pathogenesis of Hepatitis B Virus

Hepatitis is a viral disease that causes inflammation and tissue damage in the liver. It produces symptoms of fever, nausea and vomiting. There are several viruses that cause hepatitis among them Hepatitis B virus, which is also known as serum or transfusion hepatitis. HBV is classified into 8 well defined genotypes on the basis of an inter-group divergence in a complete genomic sequence (Norder *et al.,* 1994). Although severity of HBV is determined by the genotypes, epidemiological studies have shown strong association between Hepatitis B virus infection and hepatocellular carcinoma. Therefore identification of risk factors for Hepatocellular carcinoma and patient risk is important to guide future surveillance strategy (Gust, 1996).

2.5.2.2 Transmission of Hepatitis B Virus

Understanding the disease spread and distribution has been the subject of many studies. These studies have focused on the mechanism of understanding how infectious diseases spread within the communities. These studies however have helped in designing vaccination policies and public health guidelines concerning eradication program of many diseases. Understanding the mode of HBV transmission will give insights on the best method to control and prevent Hepatitis B virus in South Sudan. Hepatitis B Virus is transmitted via sex, blood transfusion and contaminated needle sharing, pre natal mother to infant transmission, injecting drugs user and nosocomial exposure (CDC, 2006). Sexual contact remains the main route of HBV transmission from HB-eAg positive patients. Major routes of HBV transmission infants is identified to the vertical transmission from mother to neonates and contaminated needles, surgical instruments at the hospitals and health centers (Abbas *et al*., 2004) vertical transmission, drug addiction sharing razor and toothbrushes and hemodialysis.

Rapid development of fast modes of travel has in many ways aided in the spread of HBV among communities. Network of sexual contacts is a common behavior that transmits HBV and is a social ingredient in continuous transmission of many diseases among them Hepatitis B HBV can also be transmitted from person to person in the household by coming in contact with body fluids and contaminated surgical instrument in the theater in addition to blood transfusion (WHO, 2002). Therefore it's essential to screen for hepatitis B virus for managing chronic cases because of irreversible endpoint of hepatocellular carcinoma, liver cirrhosis and

many other complications. But on the other hand many factors which are associated with development of chronic hepatitis into Hepatocellular carcinoma and liver cirrhosis are genetic and environmental such as old age, male sex, alcohol consumption, HIV/AIDS and co-infections with other serotypes of hepatitis B (Widjaja *et al*., 2007).

2.5.3 Prevention of Hepatitis B virus infection

2.5.3.1 Treatment of Hepatitis B-virus

Commonly used drugs in HBV management currently are nucleoside analogues (Epivir/Lamivudine, Entecavir/Baraclude, Telbivudine/Tyzeka) and one nucleotide analogue (Adefovir/Hepsera) that have been approved by united states Food and Drugs Administration (FDA) for the therapy of chronic hepatitis B virus (HBV) infection are interferon alpha (Wieland *et al*., 2000) lamivudine and adefovir (Rakesh *et al.,* 2004). Interferon alpha has both antiviral and immune-modulatory activity. Global prevention and control of HBV has become a high priority because of its sub-clinical nature of manifestation and long lasting infection which results in severe disease. Nevertheless, the therapeutic value of IFN-α is important, and there have been reports of statistically significant numbers of chronic carriers who are treated with the cytokine and with HB sAg loss (Lapostolle *et al.,* 2004; Tabor *et al.,* 2006)

2.5.3.2 Hepatitis B vaccination program

The Global Advisory Group to the World Health Organization recommended that all countries integrate Hepatitis B vaccine into national immunization programs

(Margolis *et al.*, 1995) because vaccination remains the mainstay of Hepatitis B prevention. There are other factors that play a role in Hepatitis eradication such as the genotype of hepatitis, mutation of viral genome and the viral load in the serum in addition to host factors like immune status, age, intake of alcohol and others (Gunther *et al.,* 1999; Hunt *et al*., 2000 ECGNB, 2000).

Many countries did not implement the recommendation due to lack of data on the disease prevalence and financial commitments. Although determining risk factors and Sero-epidemiological distribution of HBV among the general population can help in developing effective vaccination strategies and identify the at risk population such vaccines should be made available to all persons at risk based on the epidemiology rather than on the basis of self-reported high-risk behaviors for especially the risk group like, health worker, pregnant women and if possible women of child bearing ages, school children, blood donor, pregnant women. This is in addition to prevention of Hepatitis in special setting and other universal precaution and promotion of safer sex practices are important preventive measures that are needed for the eradication of HBV in Sub Sahara Africa.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

Juba is the capital town of south Sudan, situated on the river Nile .It has an estimated population of 372,413 (2009 census). It is connected to Northern Uganda, Kenya and Demographic republic of Congo via terrestrial routes. Being the capital of south Sudan, Juba has three main hospitals, Juba teaching hospital, EL-Sabah and military hospital. Juba teaching hospital is the biggest and the civil hospital (Figure 4. 1)

Sudan is surrounded by 9 countries Central Africa republic, Democratic republic of Congo south west, Uganda, Kenya in the South and Ethiopia, Eritrea in the east

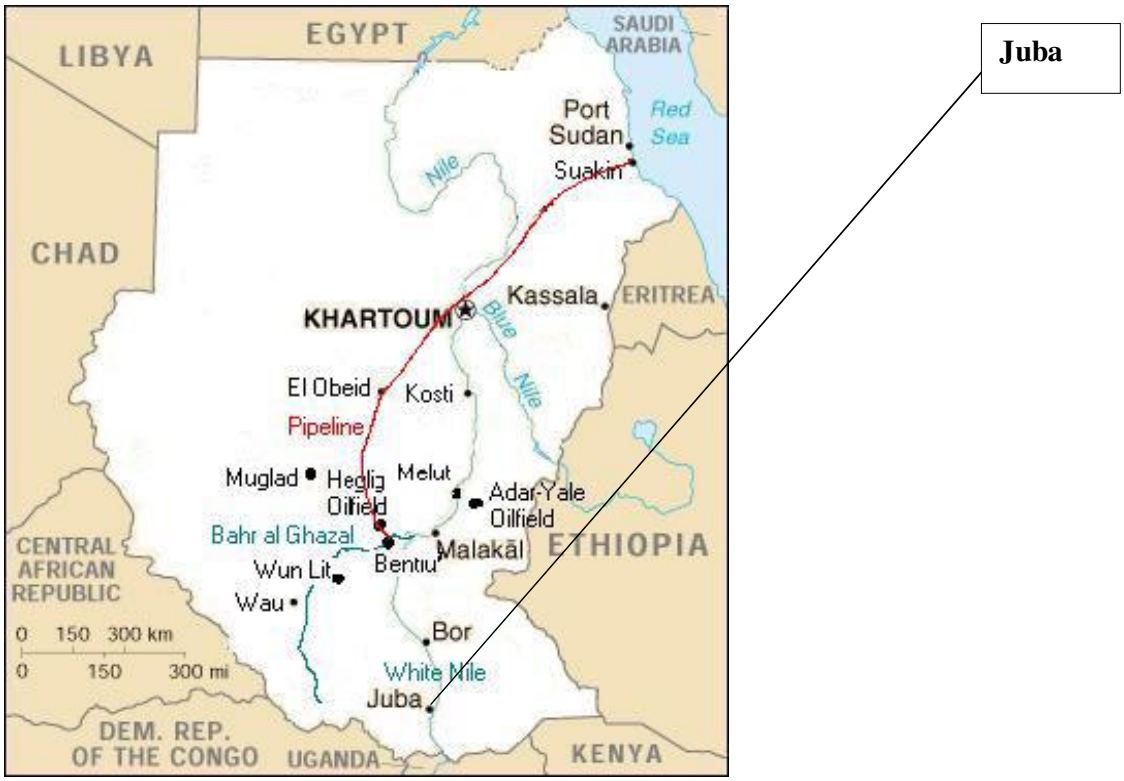

Figure 3.1 This map of Sudan showing Juba Town– Sudan

3.2 Study design

This was a cross-sectional study to determine the sero-prevalence and associated factors associated with HIV and HBV among patient attending Juba civil hospital voluntary counseling and testing centre (VCT) in southern Sudan

3.3 Study population

The study participants consisted of patients attending Juba civil hospital between the period of August and November 2009.

3.4 Inclusion criteria

I. Participants between 10 - 49 years old(male or female)

II. Who was willing to consent or assent (assent of the child and consent of their guardian)

III. Participants who was willing to provide a blood sample

3.5 Exclusion criteria

I. Any patient who did not consent or assent to the study

II. Unwilling to provide a blood sample

III. Participants who did not fall within designated age group

3.6 Sample size determination

Cochran formula (Cochran, 1963) was used for sample size determination.

$$n = \frac{z^2 \cdot p \cdot (1-p)}{d^2}$$

The following assumptions were considered in the sample size calculation:-

I. $z_{(1-a/2)}$ = value of the standard distribution corresponding to a significance level of α (alpha) (1.96 for a 2-sided test at the 0.05 level)

II. d= absolute desired precision 5% =0.05

III. P= expected proportion in the population 15% = 0.15 (based on Kenya indicator HIV/Aids survey 2007 for Nyanza province)

IV. q=1- p = 0.85

$$n = \frac{z^2 \cdot p \cdot (1-p)}{d^2}$$

$$= \frac{(1.96)^2 (.15) (.85)}{(0.05)^2}$$

$$= 192$$

V. Adjusting for possible unresponsive rate to certain questions and possible stratification during analysis an additional 25% sample size was estimated.

VI. Minimum sample size calculated was 192* 25% = **49=192+49=251**

3.7 Sampling methods

Systematic sampling was used to recruit patients into the study. Every third person was recruited until a total of 10 people were enrolled per day. If the third person was not eligible or could not consent then he/she was replaced by the next person. A semi–structured questionnaire was administered to the study participants and blood samples collected.

All participants underwent pre-test HIV counseling by certified counselors before vien-puncture. Participants could obtain their HIV results and post-test counseling confidentially through study counselors at the facilities. Adult participants were

encouraged to share their HIV results with sexual partners and minors with their parent/guardian.

3.7.1 HIV and Hepatitis B Laboratory sample collection

After a patient filled the consent that showed willingness to participate then he/she was directed to the lab. Approximately 4mL of peripheral venal blood sample was collected in plain tubes from each consenting participant using aseptic laboratory procedures. Serum was separated into different test tubes and stored until use.

3.7.2 Laboratory testing for HIV and Hepatitis B antibodies

Stored serum was tested separately for HIV and Hepatitis B virus antibodies. Hepatitis B virus was tested using one step HB $_s$Ag test kit (SD, INC, in 156-68 hagal-dong, Korea). HIV samples were batched and tested in groups of ten using rapid diagnostic test. For HIV, determine ^{TM} HIV-1/2 and uni-gold^{TM} HIV-1 test kits were used from the following companies (Trinity bio-tech Bray, Ireland & Abbott Laboratories Minato Tokyo) international and national (Sudan) guideline was used in the testing. Southern Sudan algorithm of parallel testing (determine and uni-gold were used) Negative the results from both test was considered negative while positive the result for both test was considered positive. Discordant result was tested with a tie breaker Enzyme Linked Immune-sorbent Assay (ELISA). Validation of 10% of negative HIV samples were performed using Vironistika 4th generation ELISA (Thermo multi-skan ^{R}EX Shanghai, China). Personal identifiers information

was removed during the testing time. Results were read according to CDC criteria by (Bayer *et al*., 2006; Gostin, 2006).

3.7.3 Serological testing for Hepatitis B markers

Serologic marker for HBV (hepatitis B surface antigen [HB sAg] was run on all samples (advance quality). This assay was carried out according to the manufacturer's instructions. HBV prevalence was estimated using routine HB $_S$Ag kits with a sensitivity of 97.7% and a specificity of 100% (Yu-Ping *et al* ., 2007)

3.8 Data management and statistics

Data were coded during collection and Epi-*Info* version 3.4.3 statistical software (free software provided by WHO/CDC for developing countries) was used for data entry and analysis. Double data entry was done during the study period to minimize errors by identifying inconsistently entered data file and cleaned prior to analysis done. To ensure confidentiality, the computer access was restricted by password protection.

3.8 Data analysis

Descriptive analysis was done based on frequency distribution of the selected socio-demographic characteristics. Overall sero-prevalence for HIV and HBV was calculated for the enrolled study participants followed by the specific sero-prevalence along selected socio-demographic characteristics along with their 95% confidence intervals.

During bivariate analysis for factors associated with HIV and HBV, the measure of association was Odds Ratio (OR). The cross multiplication method was used to calculate the OR using a "2 by 2" table for separate exposure groups. An odds ratio (OR) of < "1" was taken to be protective while an odds ratio of > "1" was taken as a risk factor. An odds ratio of "1" indicated that there was no difference between the study group with the outcome variable under study and that without the outcome variable of interest along various exposure factors.

A 2-tailed Chi square test with Yates correction or, when appropriate, by Fisher's exact test was used for categorical variables (nominal data) at 95% Confidences Interval (CI) and alpha level of significance set at 0.05. A p-value $\leq$ 0.05 was considered statistically significant association, while above 0.05 was considered not significant statistically association within the selected factors. Confidence interval (CI) was used to assess the variability of the odds ratio. Data for males and females were analyzed separately.

3.9 Ethical considerations

Before study initiation, ethical approval was obtained from Jomo Kenyatta University of Agriculture and Technology (JKUAT) and institution of review board (IRB) of Ministry of Health of the Government of Southern Sudan. The approval clearance from the Ministry of Health was circulated to the HIV/AIDS commission, Medical military corps Juba teaching hospital administrations for convenience. Informed consent was sought from the study participants before their enrollment in the study. The participants were made to read (or read and explained to if illiterate) the prepared statement (appendix 2) informing them of the study,

anticipated risk factors and benefits, confidentiality and anonymity before being asked if they wished to join the study.

CHAPTER FOUR

4.0 RESULTS:

4.1 Descriptive characteristics of participants attending Juba Teaching Hospital Southern Sudan, 2009

In descriptive analysis males constituted 134 of the study participants (53%, 95% CI=47%-60%). The ages of the male participants ranged from 10 to 49 years with a median age of 30 and inter quartile range (IQR) of 13 years. The ages of the female participants ranged from 16 to 49 years with a median age of 28 and inter quartile range (IQR) of 11. These median values were used to evaluate the association of age with positive HIV and HBV status during bivariate analysis

4.1.1 Sero-prevalence of HIV among persons attending VCT at Juba Hospital in Southern Sudan

A total of 251 study participants were enrolled into the study between August and December 2009. The overall prevalence of HIV was found to be 23% {(95% CI=18%-24%) n=57}. The HIV and HBV co-infection was determined as 1/251 (0.4%) among the study participants

In this study sero-prevalence for HIV was high among females 25% {95% CI=17%-34%) n=117} compared to males which was 21% {(95%CI (14%-29%) n=134}., HIV seroprevalence was 34%{(95%CI= 20%-51)n=38} among the participants aged 30-34 years, 32%{(95% CI=18%-49%)n=38] among 35-39 years, 30%{(95% CI=20%-41%) n=84} among unemployed participants, 46%{(95CI%= 27%-67%)

n=26} among separated study participants, 33%{(95%=20%-50%) n=42} and non schooled study participants as shown in (Table 4.1).

Table 4.1 Socio demographic characteristics of patients with HIV attending Juba Teaching hospital, August -November 2009

Socio demographic Characteristics	No. of HIV positive/Total enrolled study participants	HIVSero-prevalence (%)	95% CI
Gender			
Male	28/134	21	14-29
Female	29/117	25	17-34
Age-group in years			
≤ 15	0/2	0	00-84
15-19	0/5	0	00-52
20-24	10/41	24	12-40
25-29	12/75	16	09-26
30-34	13/38	34	20-51
35-39	12/38	32	18-49
40-44	3/24	13	03-32
45-49	7/28	25	11-45
Occupation			
Unemployed	25/84	30	20-41
Casual Employment	6/35	17	07-34
Official Employment	9/55	16	08-29
Self Employment	3/28	11	02-28
Student	2/20	10	01-32
Others	11/27	41	22-61
Marital status			
Separated	12/26	46	27-67
Married	40/170	24	17-31
Single	5/55	09	03-20
Education level			
Not schooling	14/42	33	20-50
Primary incomplete	9/41	22	11-38
Primary complete	11/48	23	12-37
Secondary complete	20/91	22	14-32
College/University	3/29	10	02-27

HIV seroprevalence varies throughout the age group. The most affected age group was 20-39 years as shown below (figure 4.1)

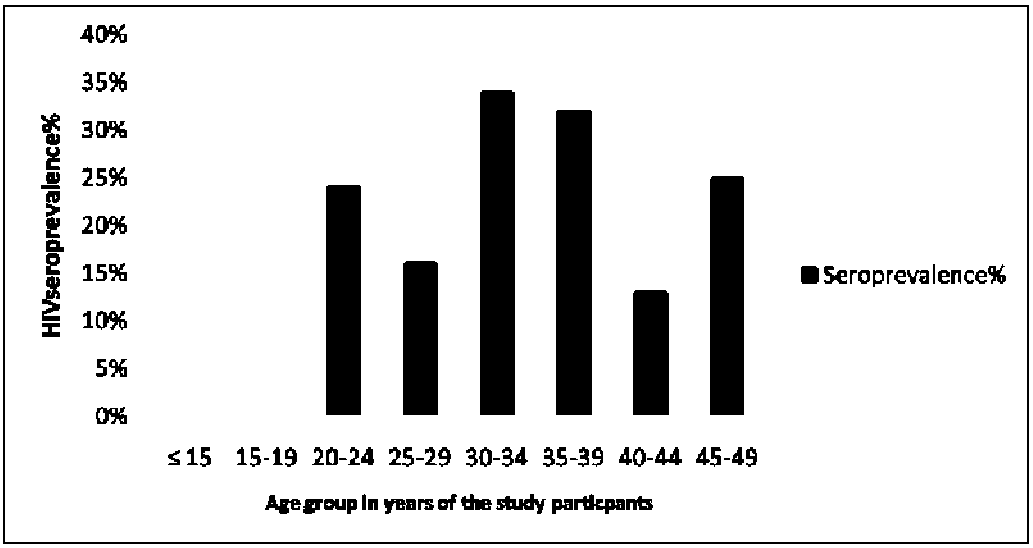

Figure 4.1 HIV Seroprevalence by age group among study participants who attended Juba teaching hospital in southern Sudan 2009

4.2 Hepatitis B results

4.2.1 Descriptive characteristics of participants with HBV in JTH in Southern Sudan, 2009

Males constituted 134 of the study participants (53%, 95%CI=47%-60%). The ages of the male participants ranged from 10 to 49 years with a median age of 30 and inter quartile range (IQR) of 13 years. The ages of the female participants ranged from 16 to 49 years with a median age of 28 and inter quartile range (IQR) of 11.

4.2.2 Sero-prevalence of HBV among persons attending VCT at Juba Civil Hospital in Southern Sudan

The study obtained HBV sero-prevalence of 18% among males (95%CI=12%-26%) n=134} and 12 % among females {95% CI=07%-19%) n=117}. Study participants in age groups below 15 years had 50% sero prevalence (95% CI=01%-99%) n=2} and those between 44-49 years had 21% sero prevalence (95% CI=08%-41%) n=28} officially employed (18% {(95% CI=09%-31%) n=35}, married 16% (95%CI=11%-22%) n=170 and those who did not complete primary education 29% (95%CI=16%-46%) n= 41) (Table 4. 2)

Table 4.2 Socio demographic characteristics of patients with Hepatitis B attending Juba Teaching hospitals, August -November 2009

Socio demographic Characteristics	No. of HBV positive/Total enrolled study participants	HBV Sero-prevalence (%)	95% CI
Gender			
Male	24/134	18	12-26
Female	14/117	12	07-19
Age-group in years			
≤ 15	1/2	50	01-99
15-19	1/5	20	01-72
20-24	5/41	12	04-26
25-29	12/75	16	09-26
30-34	7/38	18	08-34
35-39	4/38	11	03-25
40-44	2/24	8	01-27
45-49	6/28	21	08-41
Occupation			
Unemployed	13/84	16	09-25
Casual Employment	5/35	14	05-30
Official Employment	10/35	18	09-31
Self Employed	2/28	7	01-24
Student	2/20	10	1-32
Others	5/27	19	6-38
Marital status			
Separated	4/26	15	04-35
Married	27/170	16	11-22
Single	7/55	13	05-25
Education level			
Not schooling	5/42	12	04-26
Primary incomplete	12/41	29	16-46
Primary complete	6/48	13	05-25
Secondary complete	12/91	13	07-22
College/University	3/29	10	02-27

Seroprevalence of HBV among participants attending JTH VCT southern Sudan/2009

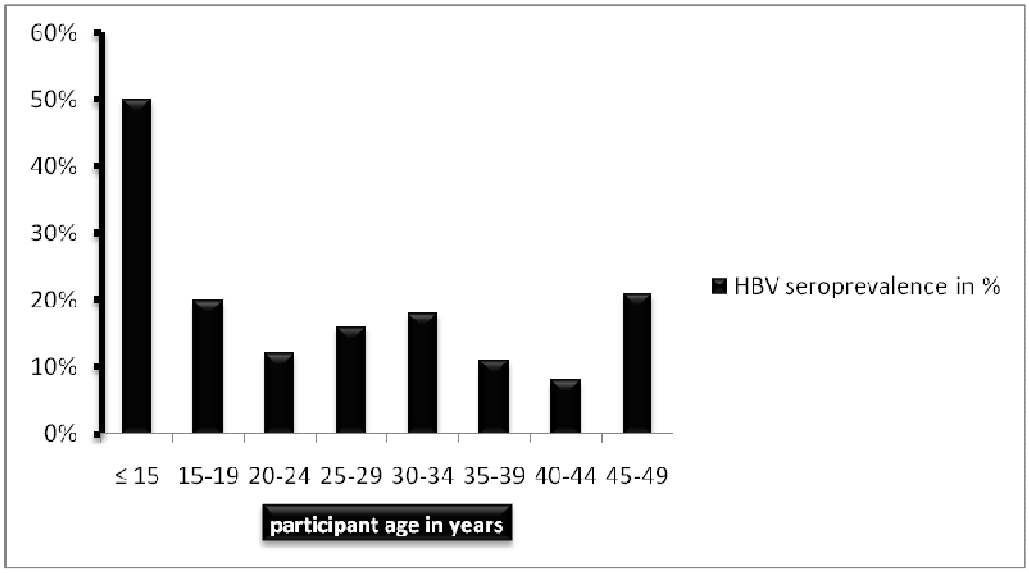

Figure 4.2 HBV seroprevalence across the age group of the participants

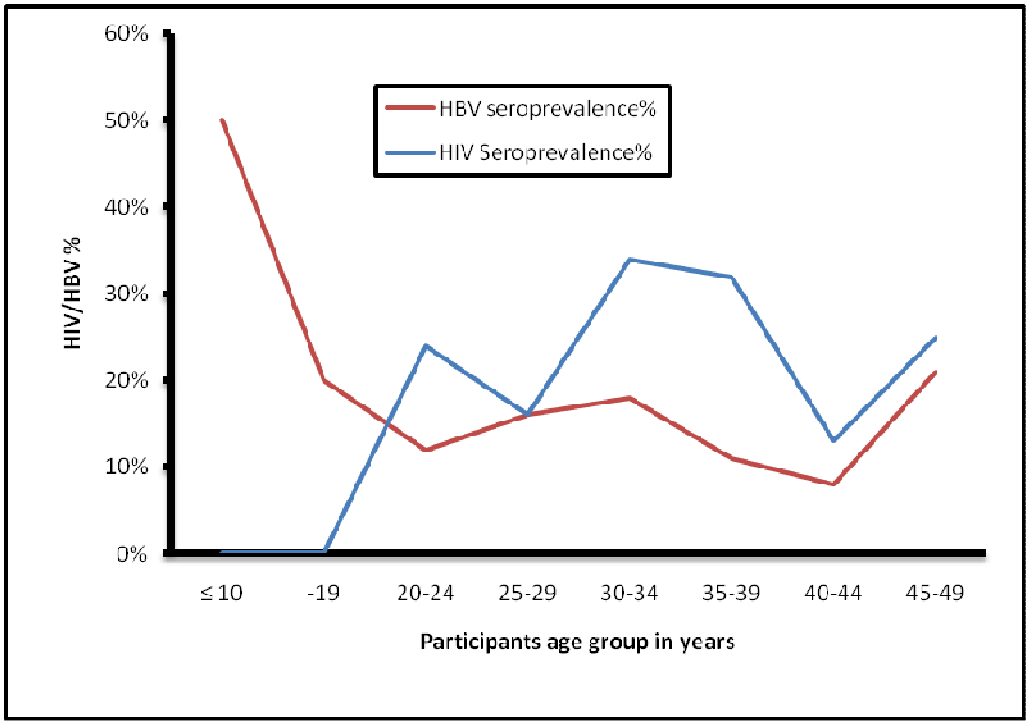

Figure 4.3 Variation of HIV seroprevalence in relation to HBV across the age group of patients in Southern Sudan, 2009

4.3 Bivariate analysis for factors associated with HIV and HBV among Male and Female participant in Juba teaching Hospital Southern Sudan

The following section is a bivariate analysis of factor associated with HIV among male and female patient in southern Sudan as referred in the (Table 4.3 & 4.4) on page 42 & 44 respectively.

Table 4.3 Factors associated with HIV positive status in male patients attending VCT clinic in Juba Teaching hospital, Southern Sudan 2009

	HIV status					
	Male (n=134)					
Characteristics	**Positive No. (%)**	**Negative No. (%)**	**Total No. (%)**	**COR**	**95%CI**	**P-Value**
Age>30 male,				**3.3**	**1.32-8.06**	**0.015**
Yes	20 (71)	46(43)	66(49)			
No	8 (29)	60(57)	68(51)			
Circumcision				**0.3**	**0.11-0.81**	**0.025**
Yes	6(21)	50(47)	56(42)			
No	22(79)	56(53)	78(58)			
Drinking Alcohol				**3.5**	**1.37-8.91**	**0.012**
Yes	21(75)	49(46)	70(52)			
No	7(25)	57(54)	64 (48)			
Single marital status				**0.2**	**0.04-0.83**	**0.03**
Yes	2(6)	31 (29)	33 (25)			
No	26 (94)	75 (71)	101(75)			
Low education*				2.1	0.65-6.70	0.36
Yes	5 (28)	10 (9)	15(11)			
No	23 (72)	96 (91)	119 (89)			
Unemployment				1.8	0.50-5.67	0.422**
Yes	6 (21)	14 (13)	20 (15)			
No	22 (79)	92 (87)	114 (85)			
Monogamy				1.5	0.62-3.62	0.49
Yes	19 (68)	62(59)	81 (60)			
No	9 (32)	44 (41)	53 (40)			
Ever admitted to hospital				1.8	0.77-4.28	0.252
Yes	12 (43)	31 (29)	43 (32)			
No	16 (57)	75 (71)	91 (68)			
Had a blood transfusion				2.0	0.17-4.48	0.734**
Yes	2 (7)	4 (4)	6 (5)			
No	26 (93)	102 (96)	128 (95)			
History of UTI ***				0.0	0.00-0.35	1.00
Yes	0(0)	2(2)	2 (2)			
No	28 (100)	104 (98)	132(98)			
Condom use last three months				0.7	0.30-1.57	0.495
Yes	14 (50)	63 (59)	77 (58)			
No	14 (50)	43 (41)	57 (42)			

NB *low education defined as not attending school or incompletion of primary school ** Fisher Exact Test *** UTI means Urinary Tract infection

JTH- Juba teaching hospital

Table 4.4 Factors associated with HIV positive status among female at JTH VCT centre in Southern Sudan, 2009.

	HIV status					
	Female (n=117)					
characteristics	Positive No (%)	Negative No (%)	Total No (%)	COR	95%CI	P-value
Age>28years				0.8	0.33-1.80	0.708
	13 (45)	45(51)	58 (50)			
	16 (55)	43 (49)	59 (50)			
Circumcision				3.1	0.04-243.83	0.878**
	1(3)	1(1)	2 (2)			
	28 (97)	86 (99)	114 (98)			
Drinking Alcohol				1.1	0.18-5.14	1.00**
	3 (10)	8(9)	11(10)			
	26 (90)	78(91)	104 (90)			
Single marital status				0.4	0.11-1.53	0.285
	3 (10)	19 (22)	22 (19)			
	26 (90)	69 (78)	95 (81)			
Low education*				1.8	0.68-4.49	0.358
	9 (31)	18 (21)	27 (23)			
	20 (69)	70 (79)	90 (77)			
Unemployment				1.8	0.76-4.34	0.257
	19(66)	45(51)	64 (55)			
	10 (34)	43 (49)	53 (45)			
Monogamy				0.8	0.35-2.05	0.88
	19(66)	61 (69)	80 (68)			
	10 (34)	27 (31)	37 (32)			
Ever admitted to hospital				1.2	0.46-3.35	0.874
	7(24)	18(21)	25 (21)			
	22 (76)	70 (79)	92 (79)			
Had a blood transfusion				0.0	0.00-7.42	0.842*
	0(0)	3 (3)	3(3)			
	29(100)	85 (97)	117 (97)			
History of UTI * **						
	1(3)	1(1)	2 (2)	3.1	0.04-246.63	0.870*
	28 (97)	87 (99)	115(98)			
Condom use last 3 months				**4.7**	**1.83-11.99**	**0.002**
	13(45)	13(15)	26(22)			
	16(55)	75(85)	91(78)			

NB *low education defined as not attending school or incompletion of primary school

** Fisher Exact Test

*** UTI means Urinary Tract infection

4.4 Outcome bivariate analysis on factor associated with HIV positive Status among males and female patients in attending VCT in Southern Sudan

Results of bivariate analysis on variables associated with positive HIV status among male participants in Juba Teaching Hospital in south Sudan revealed that only four factors were statistically significantly. Being > 30 year s (OR =3.3, P=0.015) and drinking alcohol (OR =3.5 P=0.012) were statistically found to be associated with HIV positive status .While Being circumcised (OR= 0.3 P=0.025) and single marital status (OR= 0.2 P= 0.03) were found to be a protective factor against HIV infection as referred to in (Table 4.5)

Table 4.5 Statistical significant risk and protective factors for HIV/AIDS in male patients attending VCT centre at Juba Teaching Hospital, 2009.

	HIV status					
Characteristics	**Positive No. (%)**	**Negative No. (%)**	**TOTAL No. (%)**	**COR**	**95%CI**	**P-Value**
1. Age >30 years				**3.3**	**1.32-8.06**	**0.015**
Yes	20 (30)	46(70)	66(49)			
No	8 (12)	60(88)	68(51)			
2. Circumcised				**0.3**	**0.11-0.81**	**0.025**
Yes	6(11)	50(89)	56(42)			
No	22(28)	56(72)	78(58)			
3. Drinking Alcohol				**3.5**	**1.37-8.91**	**0.012**
Yes	21(30)	49(70)	70(52)			
No	7(11)	57(89)	64 (48)			
4. Single marital status				**0.2**	**0.04-0.83**	**0.030**
Yes	2(6)	31 (94)	33 (25)			
No	26 (26)	75 (74)	101(75)			

Among the females attending VCT centre of Juba hospital the only single factor that was significantly associated with positive HIV status was not using condoms while having sexual intercourse during the last three months (Table 4.6).

Table 4.6 Statistically significant factors associated with HIV positive status among the females attending VCT centre at Juba Teaching Hospital, 2009

	HIV status					
Characteristics	**Positive No. %)**	**Negative No. (%)**	**Total No. (%)**	**COR**	**95%CI**	**P-Value**
Not using Condom last 3 months				**4.7**	**1.83-11.99**	**0.002**
Yes	13 (50)	13 (50)	26 (22)			
No	16 (18)	75 (82)	91 (78)			
Total	29 (25)	88 (75)	117(100)			

4.5 Bivariate analysis on factors associated with HBV among males and males and females the participants attending Juba Teaching hospital 2009

On bivariate analysis on factors associated with HBV , none of the expected risk factors were significantly associated with HBV for males and females (age, sex, history of blood transfusion, and circumcision, hospitalization, alcohol consumption and employment with OR more >1) P=0.05 (Tables 4.8 & 4.9) in page 47& 49 consecutively.

Table 4.7 Factors associated with HBV among male participants at JTH in Southern Sudan, 2009

Male (n=134)						
Characteristics	Positive No (%)	Negative No (%)	Total No (%)	COR	95% CI	P-value
Age>30 Male				0.7	0.28-1.68	0.554
Yes	10 (42)	56 (51)	66 (49)			
No	14 (58)	54 (49)	68 (51)			
Circumcision				1.2	0.50-2.97	0.83
Yes	11 (46)	45 (41)	56 (42)			
No	13 (54)	65 (59)	78 (58)			
Drinking alcohol				1.4	0.55-3.30	0.664
Yes	14 (58)	56 (51)	70 (52)			
No	10 (42)	54 (49)	64 (48)			
Single Marital status				0.8	0.26-2.26	0.83
Yes	5 (21)	28 (26)	33(25)			
No	19 (79)	82 (74)	101(75)			
Low education				0.7	0.14-3.22	0.894
Yes	2 (21)	13 (12)	15 (11)			
No	22 (79)	98 (88)	119(89)			
Unemployment				1.7	0.54-5.14	0.562
Yes	5 (21)	15 (14)	20 (15)			
No	19 (79)	95 (86)	114(85)			
Monogamy				1.1	0.45-2.76	0.997
Yes	15 (63)	66(60)	81(60)			
No	9 (37)	44 (40)	53 (40)			
Ever admitted to hospital				0.4	0.12-1.14	0.122
Yes	4 (17)	39 (36)	43 (32)			
No	20 (83)	71 (64)	91 (61)			
Having a blood transfusion				0	0.00-3.94	0.596**
Yes	0(0)	6 (5)	6(5)			
No	24(100)	104 (95)	128(95)			
History of UTI ***				0	0.00-24.71	1.00**
Yes	0 (0)	2 (2)	2 (2)			
No	24(100)	108 (98)	132(98)			
Condom use last three months				0.9	0.35-2.06	0.894
Yes	13 (54)	64 (58)	77 (58)			
No	11 (46)	46 (42)	57 (42)			

NB *low education defined as not attending school or incompletion of primary school

** Fisher Exact Test *** UTI means Urinary Tract infection

**** Juba Teaching hospital ***** Southern Sudan

Table 4.8 Factors associated with HBV analyzed during bivariate analysis among females attending VCT centre at Juba Hospital, 2009

	Female (n=117)					
Characteristics	**Positive No (%)**	**Negative No (%)**	**Total No (%)**	**OR**	**95% CI**	**P-value**
				1.0	**0.33-.11**	**0.802**
Age>28years	7 (50)	51 (50)	58 (50)			
	7 (50)	52 (50)	59 (50)			
Circumcision				**0.0**	**0.00-0.38**	**1.00****
	0 (0)	2 (2)	2 (2)			
	13 (100)	101 (88)	114 (98)			
Drinking alcohol				**1.9**	**0.17-.86**	**0.720****
	2 (15)	9 (9)	11 (10)			
	11 (85)	93 (91)	104 (90)			
Single marital				**0.7**	**0.07-3.51**	**0.970****
	2 (14)	20 (19)	22 (19)			
	12 (86)	83 (81)	95 (81)			
Low education*	3 (21)	24 (23)	27 (23)	**0.9**	**0.15-3.80**	**1.00****
	11 (79)	79 (77)	90 (77)			
Unemployment				**1.1**	**0.36-3.45**	**0.928**
	8 (57)	56 (54)	64 (55)			
	6 (43)	47 (46)	53 (45)			
Monogamy				**0.8**	**0.22-3.34**	**0.940****
	9 (63)	71 (69)	80 (68)			
	5 (37)	32 (31)	32 (32)			
Admitted hospital				**1.0**	**0.17-4.27**	**1.00****
	0 (0)	3 (3)	3 (3)			
	14 (100	100 (97)	114 (97)			
blood transfusion				**0.0**	**0.00-18.53**	**1.00****
	0(0)	3 (3)	3(3)			
	14 (100)	100 (97)	114 (97)			
History of UTI ***				**7.9**	**0.09-621.62**	**0.45**
	1 (7)	1 (1)	2 (2)			
	13 (93)	102 (99)	115 (98)			
Condom use				**0.6**	**0.06-2.75**	**0.710****
	2 (14)	24 (23)	26 (22)			
	12 (86)	79 (77)	91 (78)			

NB *low education defined as not attending school or incompletion of primary school

** Fisher Exact Test *** UTI means Urinary Tract infection

**** Juba Teaching hospital

4.4 Multivariate analysis for factors associated with positive HIV status among male participants in J.T.H Southern Sudan, 2009

The four factors that were statistically significant among males using bivariate analysis were (age above 30 years; being circumcised; drinking alcohol and being of single marital status) were entered in the multivariate analysis model (unconditional logistic regression) To obtain the final model of fit a stepwise backwards elimination method was used. The final best model found among four statistically significant factors associated with HIV positive status, revealed that only three factors were found to be independently associated with positive HIV status: being above the age of 30, drinking alcohol in addition to being circumcised male participants as a protective factor against HIV infection (Table 4.9)

Table 4.9: Final best fit model obtained three variables which were independently associated with positive HIV status in JTH, Southern Sudan 2009.

Characteristic	Odds Ratio	95% CI	P<Value
Age above 30 years	3.0430	1.1685-7.9250	0.0227
Being Circumcised	0.2781	0.0999-0.7742	0.0143
Drinking alcohol	2.9141	1.0920-7.7764	0.0327

CHAPTER FIVE

5.0 DISCUSSION

5.1 Back ground information

HIV and AIDS have continued to be a major cause of morbidity and mortality worldwide and have had a very devastating effect especially in the Sub-Sahara African countries. It is estimated that 33 range (31.1-35.8) million people have been infected with HIV worldwide and 2 range (1.7-2.4) million deaths annually and more than 31.1 million (29.-33.7) adults, about 15.7% (14.2-17.4) women and 2.1 million (1.2-2.9 children are living with HIV/AIDS (UNAIDS, 2008). An estimated 22.4 (67%) million adults and children were living with HIV in sub-Saharan Africa at the end of 2008. During that year, an estimated 1.4 million Africans died from AIDS. Around 14.1 million children have lost one or both parents to the epidemic.

AIDS is caused by HIV, a virus that can be passed from person to person through sexual fluids, blood and breast milk. Worldwide the majority of HIV infections are transmitted through sex between men and women, and nearly half of all adults living with HIV are women. But certain groups of people have been particularly affected and these include injecting drug users, sex workers and men who have sex with men. In many people's minds, HIV and AIDS are closely linked with these groups, which can lead to even greater stigma and prejudice against people already treated as outsiders

There is much that can be done to reduce the impact of AIDS, beginning with the prevention of HIV transmission. Averting sexual transmission involves encouraging safer sexual behaviour including delayed first sex, partner reduction and condom use. The spread of HIV through injecting drug use can be slowed by outreach work, needle exchange and drug substitution treatment. And mother to child transmission can be almost eliminated through use of Anti Retro Viral drugs (ARVs) and avoidance of breast milk.

5.2 Seroprevalence of HIV among participants attending Juba teaching hospital, South Sudan

In this study, HIV sero-prevalence was found to be 23% which is similar to the prevalence rate reported in Nyanza Province, Kenya of 20.3% (KAIS, 2007) and in a similar study in Kisumu Provincial hospital antenatal clinic (26-36%) (Van't Hoog *et al*., 2005). The 25% prevalence of HIV in females and 34% in the age group 30-34 years in men in this study is also similar to results of a study which was conducted in western Kenya (36.5%) among women aged 25-29 years (KAIS, 2007). This study also found a 30% HIV prevalence among unemployed study participants. These findings suggest that the prevalence was highest among vulnerable unemployed housewives and single or separated females. These results are consistent with the findings of the study that widows or separated women were significantly associated with HIV infections (Auvert *et al.,* (2001). Low educational level was also associated with high HIV sero-positivity status of 33% indicating low levels of awareness of HIV infection risks.

5.3 Seroprevalence of HBV among Participants attending Juba Teaching Hospital, Southern Sudan

Overall HBV sero-prevalence of 15% among participants at Juba Teaching hospital, Southern Sudan was obtained. This prevalence is higher than the World Health Organization estimated limit for endemic areas (>10%) for Sub Sahara African countries (WHO, 2007; Kiire *et al.,* 1990). These findings are however consistent with the Uganda national serosurveys that showed a prevalence of HBV surface antigen (HB sAg), a marker of chronic HBV infection, ranged from 6 to 15% among blood donors when HBV screening was introduced and in selected populations in Uganda (Watson *et al*., 1990). In high endemic regions, HBV is mainly contracted at birth or during early childhood (Wright *et al.,* 2006; WHO, 2007) and this agrees with our observations where 50% of the infected were <15 years or younger. This could be attributed to lack of early child immunization program in Southern Sudan which reduces HBV infection rates in the young and adolescents. Due to unknown reasons HBV infection rates reduce sharply between the ages of 18 to 23 years then rises again to 33% at the age of 35 39 years.

In this study, HBV prevalence among the formally employed was 18%. This was comparable to the carrier rate for hepatitis B surface antigen (HBs Ag) which is 15% to 20% in the general population in Taiwan in 1984 before the introduction of HBV mass vaccination (Chen *et al.,* 1977; Sung *et al.,* 1984).

5.4 HIV and Hepatitis B virus co-infection

HIV and Hepatitis B are related in many ways. Both diseases have equally the same mode of transmission, sexual contact, transmission in the hospital settings in addition to their similarities in their unique sub clinical signs and symptoms and devastating end point of the infection. In this study HIV and HBV co-infection proportion was 1/251 (0.04%). This is a rare situation where by co-morbidity of the two diseases is (0.4%). In a study in Manash University (Australia), prevalence was found to be 5 to 20% (Zhou *et al*., 2007). This was higher than the result obtained in this study.

More than 2-4 million people are co-infected with HIV and HBV worldwide. Although the presence of HIV is immunosuppressant in many HIV/AIDS patients including those infected with Hepatitis's can allow one again the chronic HBV cases to re-develop into acute cases. Similar studies from northwest Ethiopia by (Alter *et al*., 2006) reported HIV - HBV co-infection rate of 17/50 (34%) and the 19/50 (38%). This however is lower than the 40% HIV/HBV co-infection rate reported by (Lodenyo *et al.,* 2000) in Johannesburg in South Africa

5.5 Risk factor associated positive HIV status among participants attending Juba Teaching Hospital, Southern Sudan

Several studies have established the strong link between alcohol consumption and HIV status (p=0.033), being over 30 years of age (p=0.023) (Kapiga *et al.,* 1998; Mbulaiteye *et al.,* 2000; Hargreaves et *al.,* 2002). The association between alcohol

consumption and high risk behaviour has been demonstrated in a study in Botswana that found high HIV prevalence of 24% among alcohol consumers of age group 15 to 49 years (Simbayi *et al.,* 2004*;* Fritz *et al.,* 2002). Alcohol is the most common form of substance abuse in sub-Saharan Africa, and it has been associated with risky sexual behaviors. It may be one of the most common and potentially modifiable HIV risk factors (Obot *et al.,* 2000; *Parry et al.,* 2002). Alcohol consumption is also associated with a greater likelihood of condom failure and improper use of lubricants with condoms (Simbayi *et al.,* 2004). Condom use in every penetrative sexual act has remained one of the major indicators of behavior change in HIV/AIDS prevention.

In this study use of condoms was not regular among female participants during the last three month as reported. This simply use condom is not widely accepted in due to cultural indifference. This clearly indicates lack of condom use to be associated with HIV infections. They also do not differ with studies carried out in India which showed that consistent condom use was low among brothel-based female sex workers in India and Ethiopia (Negash *et al.,* 2003; Dandona *et al.,* 2005). Others have indicated that condom use with casual partners was determined by the interpersonal interaction between partners and less by attitudes and beliefs unlike with established partners (DeVissser *et al.,* 2001). In this study seroprevalence study female condom use was very low due unacceptability of condom in the cultural context of South Sudan or rather the confession of having used is adjourned to ethics of immoral women. Situations exist whereby a young woman would not ask for condom. This is clear in the intergenerational sex which has been associated with a

greater likelihood of unprotected sex, since these relationships are most commonly between younger women and older men (NACA, 2004).

In this study circumcision stood out as a protective factor against HIV infection (OR=0.2781, p=0.0143). This is consistent with results from meta-analysis of observational studies which found an adjusted relative risk for HIV in circumcised men was low 0.42 (0.34–0.54) (Weiss *et al.,* 2000**;** Drain *et al.,* 2004) and it has also been shown that circumcision reduces HIV transmission from women to men by approximately 60% **(**Gray *et al.,* 2000; Auvert *et al.,* 2005).In this study circumcision did, therefore, seem to offer a measure of protection against HIV infection. Kenya has instituted a major campaign to have males from traditionally non-circumcising communities circumcised following these demonstrated benefits this should fallout as practice in many African countries to reduced the incidence of HIV infection.

5.6 Factors associated with Hepatitis B among participants in Juba Teaching hospital in southern Sudan

Alcohol consumption is associated with HBV infection with (OR= 1.4 (P = 0.7) among male 1.9 P=0.7 among female times than non-consumers. This however did not show any statistical significance due to the indeterminate results.

In this study risk factors of Hepatitis like marital status, circumcision, blood transfusion, alcohol consumption, condom use and history of urinary tract infections were not statistically significant. This could be due to the inconclusive sample size s for Hepatitis B and are not worthy of further discussion.

5.7 Implications of the study findings

The results of this study suggest that HIV and HBV exist in Southern Sudan and are associated with alcohol consumption but the scale and the magnitude of both infections is not yet determined or known. There is much that can be done to reduce the impact of AIDS, beginning with the prevention of HIV transmission. Averting sexual transmission involves encouraging safer sexual behaviour including delayed first sex, partner reduction and condom use. The spread of HIV through injecting drug use can be slowed by outreach work, needle exchange and drug substitution treatment. And mother to child transmission can be reduced through use of antiretroviral (ARVs) drugs and avoidance of breast milk. HBV can be introduced to the EPI system for most at risk group school child vaccination, Vaccination of HIV positive patients' pregnant mothers and health care workers

5.9 Conclusions

1. HIV prevalence among patients attending the Juba teaching hospital was 23%.

2. Highest HIV prevalence (25%) was among females aged between 30 to 34 years. Widows or separated females had significantly high HIV prevalence.

3. Being over (>30) years of age and drinking alcohol were found to the risk factors among male participants. While not using condom was a risk factor among female participants

4. Circumcision and being single (marital status) has statistically shown to be protective factors in HIV transmission. This however is biologically plausible results obtained from different studies done in HIV/AIDS.

5. HBV sero-prevalence was 15% with males having the highest prevalence (18%).

6. None of the expected risk factors (parity, age, history of blood transfusion, and circumcision, alcohol consumption) were found to be significantly associated with HBV sAg sero-positivity

6.0 Recommendations

1. There is need for population based HIV surveys to determine the magnitude and prevalence of HIV and HBV.

2. There is need for targeted intervention programs among the population most at risk for HIV.

3. There is need for introduction of HBV vaccination in the Expanded Immunization Program (EPI) in southern Sudan for children below <15 years of age pregnant mothers and school children

6.9 Study limitations

1. This study was based in the VCT Juba teaching hospital and the results cannot be generalized to other parts of Southern Sudan because is not a representative samplings

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9.0 APPENDICES

9.1. Appendix (1)

Consent form

Questionnaires to study the morbidity of sexually transmitted diseases among patient attending juba teaching, military hospital in south Sudan

Dear/ Sir/Madam

Iam Johnson Mayik Akol from Sudan People liberation Army (SPLA)/Ministry of health, government of south Sudan and resident trainee of Field Epidemiology and Laboratory Management training Program-Kenya. Iam conducting a study on Hepatitis B virus to help improve treatment and prevention of sexually transmitted diseases and improve the public health in south Sudan. Your participation in this study is voluntary and you may choose not to participate or opt participation at any stage and it will not have any associated lose on your continued management as a patient in this or any other facility. All the information obtained from you will be kept secret and confidential and will only be available to the researcher for this purpose only. All personal identifiers will be removed and no link will be made between test results and any patient. For any questions please contact this Number: 0121050671

Do you agree to participate in the study? _____

Researcher name _____

Date / /2009

9.2 Appendix (2)

Questionnaires

I am a public health officer/SPLA health officer and I am carrying out the study on the HIV and associated risk factor within Sudan People Liberation Army and the civil population. The study findings will be used for public health interventions data will be handled confidentially.

Patient identifiers

1. Name of facility: …….

2. Date of interview……..

3. Interviewer……

4. Patient's Name …….....

5. Patient No ……

Socio-demographic information

6. Age ……

7. Sex ……

8. Occupation …….....

9. Residence ……

10. Level of education

a) Not school

b) Primary incomplete

c) Primary completed

d) Secondary complete

e) Tertiary (college, university)

11. Marital Status

a) Single

b) Married

c) Separated

12. Where were you five years ago?

a) Inside Sudan

b) Inside Sudan in refugees camp

c) Outside Sudan

d) Outside Sudan in refugees camp

e) Other places

Medical history

13. When is the last time you became sick?

a) One week ago

b) Two week ago

c) One months ago

d) Three month ago

e) More than one year ago

14. Do often you go to hospital when you are sick?

a) Yes

b) No

15 - Reason for the visit?

a) Consult a doctor

b) Return for further treatment

c) Feeling always sick

d) Buy some drugs

16. Do you normally get the treatment you need?

a) Yes

b) No

17. How is your condition after each treatment/hospital visit?

a) Well some times?

b) No improvement

c) Not sure

18. What type of facility do you normally visit?

a) Hospital

b) private clinics

c) Health centre

d) Pharmacy,

e) Herbalist/Witch doctor

f) Drug shop

g) And others

19. Last diagnoses as results of your visit to the hospital ?

a) Chest infections

b) UTI (infection)

c) T.B

d) Malaria

e) Stomach discomfort

f) Arthritis

g) And others

20. How long have you been suffering from these symptoms?

a) (6) month

b) (1) year

c) More than that

21. Have you ever been admitted to hospital once?

a) Yes

b) No

c) Reason specify_____

22. Did have blood transfusion in your life

a) Yes

b) No

c) I don't know

23. Are you circumcised?

a) Yes

b) No

Risk factor

26. Do you take alcohol?

a) Yes

b) No

27. How often? Daily,

a) Once a day

b) Once a week

c) Once a month

d) Rarely

28. How many bottles you drink at a time?

a) One

b) Two

c) Three

d) Fours

e) Not at all

29. When is the last time you had sex while you were drunk?

a. No response

b. Less than one week ago

c. One month ago

d. One year ago

30. Do you have a permanent partner apart from your wife or husband?

a) Yes

b) No

c) I don’ t know

31. How many wives or husband do you currently have?

a) One

b) Two

c) Three

d) More than three

31. Do you know about condom?

a) Yes

b) No

32. Did you use it before?

a) Yes

b) No

c) I don’t know

33. How often did you use condom with this partner in the last 3 months?

a) Always

b) Occasionally

c) Never

d) Not at all

34. Do you always known your partner's status about HBV?

a. Yes

b. No

Only for staff

35. Retrovirus test result

a. +VE

b. –VE

36. Test result of HBV

a) +VE

b) _VE