

## **HIV/AIDS Special Issue**



- **HIV/TB co-infection**
- **Utilization of PMTCT services**
- **HIV prevalence among blood donors**
- **HIV/AIDS priorities in resource-poor settings**
- **HIV infection and fracture healing**

**EDITORIAL**

HIV infection and the way forward for South Sudan Professor James G. Hakim ..... 75

**ORIGINAL RESEARCH**

Prevalence of HIV among blood donors at Juba Teaching Hospital Blood Bank, South Sudan Kenneth L L Sube, Oromo F Seriano, Rose P Gore, Salvador Jaja, Richard L Loro, Emmanuel Oryem Lino, Opiaka A Seriano, Samuel N Wani, Loboro J Alex, Kwoji R Jack, and Isaac W Abraham ... 76

Utilization of PMTCT services at Juba Teaching Hospital, South Sudan Idyoro Joseph Ojukwu, Shadrag Ojwang and Gachuno Onesmus ..... 81

HIV and TB co-infection in South Sudan: a three year retrospective study Kenneth L L Sube, Oromo F Seriano, Salvador Jaja, Rose P Gore, Richard L L Loro, Emmanuel Oryem, Opiaka A Seriano, Ayuel D A Nul, Jurel P M Magok, Akual K T Myik, Arek M D Mabok, Louis Y M Bani and Nguach A A Thiep ..... 86

**MAIN ARTICLES**

Prioritizing resources for treatment of HIV/AIDS in resource poor settings Denis Mali ..... 91

HIV infection and its effects on fracture healing: a literature review Brian B. B. Madison ..... 94

**BACK COVER POSTER:** Counselling Card number 22 from the set ‘UNICEF Infant and Young Child Feeding: counselling cards for community workers’ ..... 96

**Cover photo:**

WORLD AIDS DAY Red Ribbon

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The *South Sudan Medical Journal* is a quarterly publication intended for Healthcare Professionals, both those working in the South Sudan and those in other parts of the world seeking information on health in South Sudan. The Journal is published in mid-February, May, August and November.

*Reviewers are listed on the website*

## HIV infection and the way forward for South Sudan

In the last thirty-three years HIV infection has spread to all corners of the world, but the largest concentration of the epidemic is in Sub-Saharan Africa where 70% of the 35 million people living with HIV/AIDS in 2013 are found. The advent of peace and independence in South Sudan brought a rush to rebuild the nation. The potential wealth from oil brought back South Sudanese from the diaspora and attracted migrants from the region, and the intermingling of populations created an environment ripe for the transmission of HIV. The epidemic in South Sudan is generalized with a prevalence rate of 3%. There are high risk populations such as commercial sex workers with much higher prevalence rates. The push to reduce the spread of new HIV infections and to put more people on treatment remains a huge challenge. There is a still lack of information and public awareness in terms of transmission, prevention and treatment.

South Sudan must urgently adopt strategies which elsewhere have changed HIV infection from a deadly infection to a chronic disease.

In this issue of the SSMJ important aspects of HIV infection including the safety of blood products, TB/HIV co-infection, prevention of mother to child transmission (PMTCT) and impaired bone healing are presented. At the outset of the HIV epidemic haemophiliacs were one of the earliest groups that suffered as a result of unsafe blood. The safety of blood and blood products is a critical aspect of HIV prevention, which in South Sudan leaves much to be desired. The prevention strategy has advanced greatly and includes: HIV testing and counselling, behaviour change, condom use, voluntary medical male circumcision, pre-exposure prophylaxis and the use of antiretroviral therapy (ART). Moreover the distinction between prevention and treatment has become blurred. An example is that PMTCT is now achieved with triple ART including agents such as efavirenz which only a few years ago were considered potentially teratogenic and contraindicated in pregnancy. The

PMTCT option B+, in which all HIV positive women identified during pregnancy, labour or while breastfeeding are started on ART for life irrespective of CD4 counts or WHO clinical stage, is seen as a cornerstone of the elimination of HIV in children while ensuring that mothers get optimal ART care.

In South Sudan there is a paucity of information about basic opportunistic infections in HIV infected patients including tuberculosis, pneumocystis jiroveci pneumonia, cryptococcal disease, bacterial infections, Kaposi's sarcoma and carcinoma of the cervix which have hitherto been considered the *sine-qua-non* of AIDS. The country must invest in research in understanding how widespread these co-infections are in order to inform policies and strategies needed to counter their effects. South Sudan is at the beginning of a steep learning curve. Knowledge, attitudes and practice must drive appropriate behaviour change and implementation of biomedical strategies if we are to prevent a spiralling of the epidemic. South Sudan must urgently adopt strategies which elsewhere have changed HIV infection from a deadly infection to a chronic disease.

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# Prevalence of HIV among blood donors at Juba Teaching Hospital Blood Bank, South Sudan

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## Abstract

### Objectives

The aim of this study is to determine the prevalence of HIV among blood donors in Juba Teaching Hospital Blood Bank, South Sudan in 2013.

### Method and Materials

This is a retrospective study that involved the abstraction of data from registers at the blood bank. Data were collected onto data sheets and entered into a computer database. Statistical analysis was performed using SPSS Version 20 Software. A p value of <0.05 was considered statistically significant.

### Results

Out of 1095 blood donors, 1074 (98.1%) were males and 21 (1.9%) were females. The mean age and the range for the whole group was 29+7.16 (15-69) yrs. The prevalence of HIV was higher among males than females 85 (7.9%) vs 1 (4.8%) respectively but this was not statistically significant ( $p=0.6$ ). The 20 to 29 year age group had the highest prevalence of 49 (57%) with no statistical significance ( $p=0.3$ ). The prevalence of HIV was 7. % (86) and there were co-infections between HIV and HBV, HCV and syphilis of 14 (50%), 5 (18%), 9 (32%) with  $p=0.7$ ,  $p=0.1$ ,  $p=0.8$  respectively. Blood group O positive had the highest percentage 58.1 % ( $n=50$ ) and was the commonest group.

### Conclusion

In this study, HIV prevalence is very high among blood donors at the Juba Teaching Hospital blood bank.

## Background

Since the first reported cases in 1981, HIV remains one of the most serious health and developmental challenges worldwide [1]. HIV is one of the most frequently recorded transfusion-transmissible infections (TTIs) [2]. HIV screening among blood donors is therefore a key safety issue in addition to screening for other TTIs such as HBV, HCV and syphilis. According to the World Health Organization (WHO) guidelines screening of all blood for TTIs should be mandatory [3]. As a result, there is reduction in TTIs in countries where routine serological screening of donors is carried out [4].

The prevalence rate of HIV among blood donors differs between countries and regions depending on several factors such as the general HIV prevalence, education of the public regarding blood donation, the selection of donors and pre-donation screening [3]. As a result in high income countries, the prevalence of HIV among blood donors is as low as 0.001% while in low income countries it may be higher than 0.5%.

The Republic of South Sudan has emerged from war in the past 9 years. These were years of isolation, but with the advent of peace there is a great movement of people between South Sudan and neighbouring countries and within South Sudan. Countries bordering South Sudan, such as Kenya, Uganda and the Democratic Republic of Congo, have high HIV prevalence rates of 6.3%, 6.5% and 1.6% respectively [5]. These high rates and the movement of people is likely to fuel the HIV/AIDS epidemic in South Sudan, and the impact is likely to be felt most in Juba.

Juba Teaching Hospital is a tertiary referral hospital with 500 beds and this is where the main blood bank has been located until July 2014 when the National Blood Bank was inaugurated. This provides services for the whole country. We searched the literature and could not find any information on the prevalence of HIV among blood donors in the Republic of South Sudan.

The aim of this study was to determine the prevalence of HIV among blood donors in Juba Teaching Hospital

Blood Bank.

**Method and materials**

This is a retrospective study involving analysis of blood donors' records in the blood bank of Juba Teaching Hospital from June to August 2013. These two months were randomly selected from the twelve months of the year.

From the records demographic data (age and sex), transfusion transmissible infections test results (HIV+ve/-ve, HBsAg+ve/-ve, HCV+ve/-ve, and syphilis serology +ve/-ve) and blood group results (A, B, AB, O and Rhesus +ve/-ve) of the donors were abstracted. HIV, HBsAg, HCV and VDRL/Syphilis were tested using Uni-Gold (Trinity Biotech Plc-Ireland), HBsAg (Cypress diagnostic-Belgium) dipstick, Anti-HCV (Cypress diagnostic-Belgium) dipstick, and VDRL (Cypress diagnostic-Belgium) dipstick respectively. Antisera (Cypress diagnostic-Belgium) was used to identify respective blood groups. Out of 1195 blood donors, only 1079 had a complete set of variables in the records, and so were included in the analysis.

Ethical clearance was obtained from the Ethical Committee of the National Ministry of Health.

Data were collected onto data sheets and then entered into a computer database. Statistical analysis was performed using SPSS Version 20 Software. A p-value of <0.05 was considered statistically significant. Descriptive statistics were used to summarize the data in the form of means, medians, standard deviation and frequencies. Results are displayed in tables and a pie chart. Chi-square test was used to determine associations of categorical variables. A p-value <0.05 is regarded as statistically significant.

**Results**

Of the 1095 blood donors in this study, 1074 (98.1%) were males and 21 (1.9%) females. The mean age for the range for the whole group was 29+7.16 (15-69) years: for males it was 29.1+7.18 (15-69) years while for females it was 26.9+5.79 (18-45) years.

The prevalence of HIV in males was 85/1074 (7.9%) and in females 1/21 (4.8%), p=0.6 with the age group 20-29 years with highest prevalence (4.5%) - see Table 1. In the sub-population with TTIs there were 86/420 (20%) HIV+ve, 195/420 (47%) HBsAg+ve, 34/420 (8%) HCV+ve, and 105/420 (25%) VDRL+ve blood donors as illustrated in Table 2 and Figure 1.

**Table 1. Distribution of HIV status (number and %) by age groups of blood donors**

	Age Group (Years)				Total
HIV positive	<19	20-29	30-39	40-49	
p-Value	5 (0.5%)	49 (4.5%)	24 (2.2%)	8 (0.7%)	86 (7.9%)
	0.9				

**Table 2. Distribution of TTIs by sex among blood donors**

	HIV +ve	HBsAg+ve	HCV+ve	VDRL+ve	Total
Male	85 (99%)	193 (99%)	34 (100%)	102 (97%)	414
Female	1(1%)	2(1%)	0	3(3%)	6
Total	86	195	34	105	420

**Table 3. Distribution of blood groups among blood donors**

Blood group	Frequency	Percentage (%)
A+ve	270	24.7
A-Ve	2	0.2
B+Ve	179	16.3
B-Ve	0	0
AB+Ve	21	1.9
AB-Ve	0	0
O+Ve	614	56.1
O-Ve	9	0.8

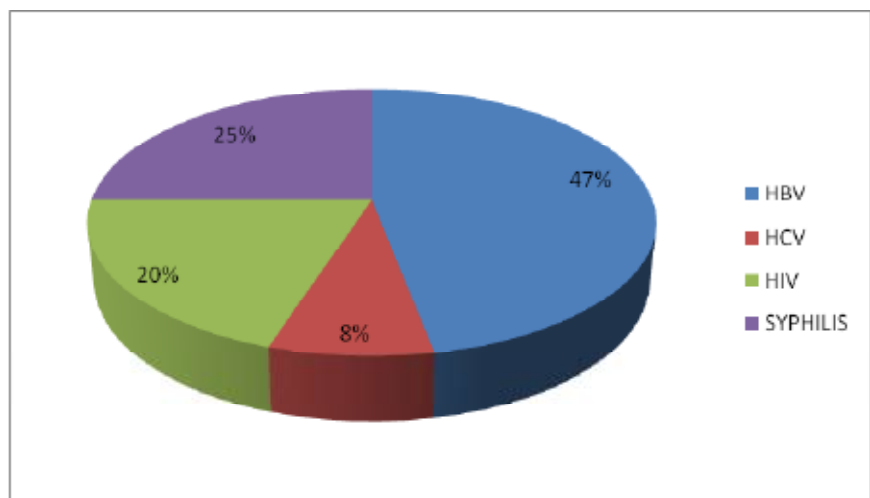


Figure 1. Distribution (percent) of HIV, HBV, HCV and syphilis among blood donors



**Table 4. Distribution of HIV status by blood groups of blood donors.**

	Blood Groups								Total
	A+Ve	A-Ve	B+Ve	B-Ve	AB+Ve	AB-Ve	O+Ve	O-Ve	
<b>HIV Positive</b>	<b>18 (21%)</b>	<b>0(0%)</b>	<b>15 (17.4%)</b>	<b>0(0%)</b>	<b>3 (3.5%)</b>	<b>0(0%)</b>	<b>50 (58.1%)</b>	<b>0 (0%)</b>	<b>86 (100%)</b>
<b>HIV Negative</b>	252(25%)	2(0.2%)	165(16.4%)	0(0%)	18(1.8%)	0(0%)	563(55.8%)	9(0.9%)	1009
<b>Total</b>	270	2	180	0	21	0	613	9	1095
<b>p-Value</b>	0.7								

Among the blood groups of the donors, blood group O positive had the highest percentage in the whole population (n=614; 56.1%) - see Table 3 - and of those infected with HIV (n=50; 58.1%) and the least were O negative with (n=0) with p=0.7 as shown in Table 4.

There was no A negative, B negative and AB negative among the blood donors. There were co-infections between HIV and HBV, HCV and syphilis of 14 (50%), 5 (18%) and 9 (32%) with p-values of 0.7, 0.1, 0.8 respectively.

### Discussion

The first case of HIV/AIDS in the Republic of Sudan was reported in 1986 before the independence of South Sudan. The Sudan National AIDS Control Programme (SNAP) was established in 1987 [6]. While the demand for blood products will continue to be high because of the need of blood in surgical, obstetrical, medical and other conditions, HIV poses an immense challenge to transfusion medicine in regions of the world where the quality of blood can not be guaranteed. Hence for the safety of blood and its products, strategies to select appropriate blood donors are important and all donated blood should be tested for HIV and other transfusion transmissible infections.

The prevalence of HIV among blood donors in this study was 7.9% which is very high. This is higher than studies conducted in Nigeria which report HIV prevalence rates ranging from 0.45% to 7.7% [7]. Also studies conducted in Ethiopia show levels between 3.5% to 5% as reported by Ethiopian Federal Ministry of Health. Other studies in Ethiopia have however reported very high prevalence rates of 16.7% [8], 10.6% and 11.9% [9]. In Ghana a prevalence rate of 3.5% [10] has been reported.

The prevalence of HIV is high in South Sudan mainly because most, if not all, blood donors are family replacement donors rather than voluntary donors. Schneiber and Busch 1996 [11] assert that commercially remunerated blood and family replacement blood donation are more likely to transmit TTIs than voluntary donors. Indeed the majority of blood donors in sub-Saharan Africa are family replacement donors who have a higher risk for TTIs [12, 13].

In this study there were fewer female blood donors than

male donors. Other African studies have shown low female blood donor percentage [14, 15]. This observation has also been reported in many studies done in Asia [16]. Low blood donation by women is attributed to cultural beliefs in South Sudan that women should not donate blood because of the monthly blood loss that occurs during menses. Hence the few who donate blood are those forced to do so when male relatives or friends are not available to donate blood for relatives requiring blood products. There is no scientific basis for this belief, so potential female blood donors should be encouraged to donate blood. This can be achieved by increasing public awareness through the mass media, civil societies, community based organizations, religious leaders, community leaders, women groups, etc. The recruitment and training of more female staff will also encourage more women to come forward and donate blood.

In this study HIV contributes 20% (86) of all TTIs. This percentage is a higher than in the study by Azene *et al* in Ethiopia who reported the contribution of HIV to all TTIs to be 11.7%. The most affected age group was the 20-29 years group (n=49, 57%) of all HIV positive donors, although this was not statistically significant (p=0.9). This is similar to an Ethiopian study where 58.2% of HIV positive blood donors were in the 20-29 years age group [17]. The difference with our study is that it was much larger and covered a period of 4 years.

Co-infection between HIV and the other TTIs does occur since they have the same mode of transmission namely: sexual intercourse, mother to child, and blood transfusion. Barth *et al* [18] noted that the prevalence rates of HBsAg+ve and HCV+ve among HIV positive donors were 15% and 7% respectively. These figures are less than in our study (50% and 18%) which may be due to the fact that our sample size is smaller.

Even though blood group O positive is the most infected and commonest blood group, statistically, it is not significant (p=0.7). This may be due to blood group O being a universal donor and so is easily used as a replacement donor.

### Recommendations

In consideration of the results of this study, we

recommend strengthening of the health system as well as increasing public awareness towards encouraging more voluntary donors than family replacements. Health Education should focus on changing sexual behaviours of youth so as to have an impact in reducing prevalence of HIV among blood donors.

A study is needed to determine the distribution of blood groups among the population.

There is a need to monitor the trends in the prevalence of HIV and other TTIs among blood donors over time and to institute strategies to reduce these infections.

### Limitations of the study

1. Data were collected during only 2 months in the year, and from only one blood bank.
2. There were no data on the selection of donors (presumed to be family replacement donors) or their level of education.

### Acknowledgements

We are grateful to the director of Juba Teaching Hospital, Dr Wani Lolik, for allowing us to conduct this study at the hospital, and to the director of Laboratories, Mr Charles Mazinga and his colleagues for permitting us to collect data from the blood bank registration book.

### Conflicts of interest

None.

### Contributors

All members participated and contributed equally in this research varying from literature review, questionnaire design, data collection, entry and statistical analysis, and typing, discussing and reviewing the manuscript.

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## South Sudan Forms the General Medical Council

### Press Release from the Ministry of Health

On my own behalf and on behalf of my colleagues in both the public and private health sector, I am pleased to inform all of you that the Council of Ministers has unanimously endorsed the formation of the South Sudan General Medical Council, as per the Provisional Order, 2014 for the formation of the council.

The Council of Ministers has endorsed the nominees for the General Medical Council as indicated in the following table:

S/N	Name	Position
1	Prof. John Adwok Adieng	Chairperson
2	Prof. Mayen Machut Aciek	Deputy
3	Dr. Anthony Lupai Simon	Member
4	Dr. Dario Kuron Lado	Member
5	Dr. Peter Adwok Otto	Member
6	Dr. Jino David Ladu	Member
7	Dr. Rose Ajak Costa	Member
8	Dr. James Vacilli	Member
9	Dr. Mabior M. Deng	Member
10	Dr. Edward Luka	Member
11	Dr. John Pasquale Rumunu	Member

12	Dr. Margaret Betty Eyobo	Member
13	Dr. Victoria Stephen Majur	Member
14	Dr. Emmanuel Oryem Lino	Member
15	Dr. Benjamin Malek	Member
16	Dr. Buchay Othom Rago	Member
17	Dr. Santino Lino	Member
18	Dr. Cain Jacob	Member

The South Sudan General Medical Council is an important regulatory body that will ensure proper conduct of business in the health sector. With the council operational, the current illegal involvement of non-qualified personnel and malpractices in the sector will be brought to an end. Those who are qualified to do the business in the sector will do that comfortably within the approved norms and regulations governing the sector.

I would like to take this opportunity to congratulate the chairperson, his deputy and all the members of the Medical Council for the trust bestowed upon them by H.E President Salva Kiir and the entire cabinet. Together we can build a very strong health sector that our people deserve.

Yours Sincerely,

**Dr. Riek Gai Kok**

Minister for Health

Republic of South Sudan



# Utilization of PMTCT services at Juba Teaching Hospital, South Sudan

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## Abstract

### Objective:

To determine the uptake of PMTCT services by mothers attending postnatal services at Juba Teaching Hospital.

### Study Design:

A cross-sectional study conducted at the Mother and Child Health (MCH) clinic between May and August 2012

### Results:

All 300 women recruited had at least one antenatal care visit and 246 (82%) received antenatal counselling for HIV: 201 (67%) were tested and 15 (7.5%) were positive. Thirteen of these HIV positive mothers delivered in a health facility. CD4 tests were not done. Three mothers were put on single dose Nevirapine and two on a more efficacious ARV combination, the rest did not receive an ARV. Ten of HIV exposed infants received Nevirapine after delivery. Not all of the HIV-exposed babies were tested by polymerase chain reaction/deoxyribonucleic acid (PCR/DNA). Six babies were on exclusive breastfeeding for the first six months with four on formula and five on mixed feeding. Six mothers were not using any mode of family planning, one used condoms, one had an IUCD and one used dates (natural) method.

### Conclusion:

Although the majority of the mothers received HIV counselling during the antenatal period less than 70% were tested for HIV. CD4 count testing was not routinely done and the use of HAART and other more efficacious ARV combinations were rarely used. DNA/PCR was not routinely done for HIV exposed infants. Safe infant feeding practices were limited. A majority of those with HIV positive partners did not practice safe family planning methods.

## Introduction

The United Nations General Assembly Special Session on HIV/AIDS (UNGASS) declaration of 2001 committed the member countries to reduce the number of infants infected by HIV/AIDS by 50% in 2010, by ensuring that 80% of pregnant women receive HIV information, counselling, testing, interventions to prevent vertical transmission and other HIV prevention services [1]. The strategy towards universal elimination of mother-to-child transmission of HIV includes seven principal strategic directions [2].

The WHO guidelines [3] recommend that:

- Mothers diagnosed as HIV positive during pregnancy begin a triple antiretroviral regimen immediately irrespective of their CD4 count and remain on the same regimen throughout pregnancy and continuing for life.
- Infants born to HIV positive mothers receive daily

NVP or AZT from birth until age 4-6 weeks regardless of infant feeding method.

- Appropriate family planning is offered during the antenatal period. This helps to reduce risks of unwanted pregnancies and HIV transmission to uninfected partners. Strengthening the link to family planning services and condom access for dual protection offers a chance to further prevent MTCT.

The broad objective of this study was to determine the utilization of PMTCT services among women seeking MCH services. The specific objectives were to determine the proportion of mothers:

1. Attending postnatal services who underwent HIV counselling and testing, intra-partum and postpartum;
2. Testing positive who had CD4 count, clinical staging and ART treatment;
3. Testing positive who delivered in a facility and were

practicing safe infant feeding; and

4. Testing positive with no pregnancy intention who had initiated family planning.

## Materials and method

### Study design

This was a cross-sectional study whereby all consenting and eligible postnatal mothers bringing their children for immunization at the MCH clinic up to 9 months after delivery at Juba Teaching Hospital during May to August 2012 were enrolled.

A sample size of 300 was estimated as the number required to define the uptake of services using the Cochrane method [4]. All mothers who agreed to join the study were given the consent form with a verbal explanation for those who could not read.

### Data collection and management

The principal investigator trained research assistants on the enrolment algorithm, privacy of participants' information and ethical issues. The data were collected using a structured questionnaire through direct interview. Data management used MS Access 2007 (Microsoft Corp, Seattle, USA) while statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS 17.0, SPSS Inc. Chicago).

### Ethical consideration

Ethical clearance was obtained from University of Nairobi and Kenyatta National Hospital Research and Ethical Committee, and the Ministry of Health, Republic of South Sudan Research and Ethical Committee.

## Results

### Socio-demographic characteristics

Table 1 shows the socio-demographic characteristics of the 300 enrolled mothers and their partners.

### HIV counselling and testing

Of the 246 mothers reported as receiving HIV counselling, 201 reported being tested for HIV and among these 15 were HIV positive – see details in Table 2. No CD4 counts had been done.

### ARV/ART intervention

Of the 15 HIV positive women, only five received antiretroviral drugs for PMTCT, three received single dose Nevirapine (NVP) and two had highly efficacious antiretroviral regimen – see Table 2.

**Table 1. Socio-demographic characteristics of mothers and their partners**

Characteristics		
Mothers (n=300)		
<b>Age years</b>		
Mean (SD)	25.4 (5.3)	
Median (IQR)	25 (22-28)	
Min - Max	13-42	
<b>Parity</b>		
Mean (SD)	2.9 (1.8)	
Median (IQR)	2.0 (1.5-4.0)	
Min-Max	1-10	
<b>Frequency</b>		
	n	%
<b>Level of education</b>		
Not educated	63	21.0
Primary	102	34.0
Intermediate	5	1.7
Secondary	92	30.7
College/university	38	12.7
<b>Employment status</b>		
House wife/ unemployed	207	69.0
Employed	93	31.0
<b>Marital status</b>		
Not married	11	3.7
Married	285	95.0
Divorced / Separated	4	1.3
<b>Husbands (n=300)</b>		
<b>Age in Years</b>		
Mean (SD)	33.9 (8.8)	
Median (IQR)	32.5 (28-38)	
Min - Max	13-65	
<b>Frequency</b>		
	N	%
<b>Alive</b>		
Yes	297	99.0
No	3	1.0
<b>Educational level</b>		
None	14	4.7
Primary	46	15.3
Intermediate	11	3.7
Secondary	118	39.3
College/university	111	37.0
<b>Number of wives</b>		
1	196	65.0
2 or more	104	35.0
<b>Employment status</b>		
Unemployed	26	8.7
Employed	274	91.3

### Infant PMTCT intervention

Of the 15 HIV positive mothers only 10 reported that their babies received NVP after delivery while 5 reported no intervention. Nine of those babies who had NVP received it during the first six months and one for only one month. PCR/DNA testing was not routinely done and none of the 15 HIV exposed babies received testing despite the fact that 10 of them were aged around nine months. Six mothers practiced exclusive breastfeeding for the first six months, 5 mixed fed and 4 formula-fed their babies.

### Family planning among HIV positive partners

Only six of the HIV positive mothers had delivered more than six weeks previously and so were eligible for family planning. Three were not using any family planning method, one used condoms, one had an IUCD and one used the 'dates' methods.

### Discussion

Antenatal counselling and testing is crucial in PMTCT. In this study 82% received counselling during their antenatal clinic visit compared to Kenya where antenatal testing and counselling uptake is more than 90% [5]. The lack of testing is a missed opportunity for those who could have been HIV positive leading to a risk for infant HIV infection. The reasons could be attributed to lack of provider initiation, inappropriate integration of PMTCT services into the antenatal care systems, or lack of understanding of the importance of perinatal HIV testing. Personal factors include a need to consult a partner, fear of results, no perceived need due to previous negative test, and cost when attending private clinics [6].

The prevalence of HIV was 7.5% among the 201 mothers who were HIV tested antenatally, compared to 6% of 299 found in an earlier study done in South Sudan among antenatal mothers in Juba Teaching Hospital [7, 8] this difference could be due to the smaller sample in this study.

Antenatal intervention for HIV positive mothers is the cornerstone in reducing mother-to-child transmission. This includes a CD4 count, clinical and laboratory staging, antiretroviral therapy and counselling on infant feeding. None of the 15 HIV positive mothers had had a CD4 count or clinical staging, which reflects lack of adherence to guidelines and availability of equipment for CD4 testing. A cohort study on effectiveness of antiretroviral therapy in South Africa has shown that each month of HAART is associated with increase in CD4 cell count of 15.1 cells/ml, which in turn further reduces MTCT of HIV [9].

The uptake of ARV/ART was low among the 15 HIV positive mothers. This could be attributed to shortage of drugs or health facility factors such as lack of proper counselling on adherence. In 2011, 59% of pregnant women living with HIV had received antiretroviral therapy or prophylaxis during pregnancy and delivery in sub-

**Table 2. PMTCT services intervention given to the mothers and their partners**

Variable	Frequency	
	n	%
<b>Mothers counseled for HIV test (n=300)</b>		
Yes	246	82.0
No	48	16.0
Did not know	6	2.0
<b>Mothers tested for HIV(n=300)</b>		
Yes	201	67.0
No	93	31.0
Did not know	6	2.0
<b>Mothers Result for HIV (n=201)</b>		
Positive	15	7.5
Negative	181	90.0
Did not know	5	2.5
<b>Mother's CD4 test done for PMTCT</b>		
Did not know	15	100.0
<b>ARV/ART intervention among HIV positive mothers (n=15)</b>		
Yes	5	33.3
No	10	66.7
<b>Regimen used for HIV positive mothers (n=15)</b>		
Sd NVP	3	20.0
AZT+3TC+NVP	1	6.7
AZT+3TC+LPV/r	1	6.7
Co-trimoxazole	5	33.3
Multivitamin	1	6.7
Nothing	3	20.0
Don't know the drug	1	6.7
<b>Disclosure of HIV+ status to partner (n=15)</b>		
Yes	7	46.7
No	8	53.3
<b>Partners tested</b>		
Yes	124	41.3
No	114	38.0
Did not know	62	20.7
<b>Partners HIV results (n=124)</b>		
Positive	7	5.6
Negative	114	91.9
Did not know	3	2.4
<b>Partners intervention</b>		
Co-trimoxazole	2	40.0
Did not know	3	60.0

Saharan Africa [10]. In this study only 40% of the mothers received either co-trimoxazole or multivitamins. On average MTCT rates are 15% for Sd NVP, 6.5% for more efficacious dual regimens and 2.4% for three-drug ARV combination [7, 11]. In sub-Saharan Africa the coverage of antiretroviral medicine for preventing mother-to-child transmission of HIV in 2010 was 50% for the effective regimens and 10% for single dose NVP [12].

Health facility delivery enhances the opportunity for HIV testing during the antenatal period and provides both intrapartum and immediate postpartum HIV testing which in turn will help in early infant intervention in terms of prophylactic antiretroviral drugs. Health facility delivery was more common among the HIV positive mothers (85.7% vs. 83.8%  $p=0.05$ ). This shows that PMTCT intervention at the facility level could have been achieved during delivery and thus reduced the number of untested mothers. Those who tested positive could have been put on ART/ARV.

While a study in Kenya showed 90% of exposed infants being on antiretroviral drugs [6], in this study only 10 of the 15 infants born to the HIV positive mothers received NVP after delivery. At the time of the interview 7 of the babies at age 6 months were still on Nevirapine syrup, two were aged more than six months and were continuing with the Nevirapine syrup while one used Nevirapine for one month and was still breastfeeding. This shows an inadequate counselling on use of the medicine and could also be attributed to health system factors.

All the exposed infants did not have DNA/PCR testing and were still receiving prophylaxis. This may mean that some of the babies could be receiving prophylaxis instead of treatment for HIV. Every HIV exposed infant should be screened for DNA/PCR at six weeks, and followed for 2 years (e.g. during immunization and growth monitoring). Early infant diagnosis (age 0 to 18 months) in Kenya showed a prevalence of 8.4%. [7, 13, 14]

It is recommended [15] that:

- HIV exposed infants are exclusively breastfed for the first six months unless replacement feeding is safe and affordable;
- Mixed feeding is avoided;
- Breastfeeding stops only when other foods can provide an adequate safe diet.

Extended antiretroviral prophylaxis during the entire breastfeeding period reduces postnatal transmission of HIV in breastfed infants. The Kesho Bora study found that giving HIV positive mothers a combination of 3 antiretroviral drugs reduces transmission during

breastfeeding by 54% [16]

Knowing the HIV status of one's partner is critical and forms an important entry point for establishing prevention among couples as well as providing access to prevention, care and treatment services for the whole family [10]. Disclosure of HIV positive status helps to improve mode of infant feeding in case the mother had preferred exclusive breastfeeding or formula feeding. It also supports the mother to adhere to antiretroviral drugs both for herself and baby without fear. Providers should encourage couple counselling, testing, disclosure and positive living among HIV infected women. This study found that only 7 of the 15 HIV positive mothers had disclosed their HIV status to their partners.

Family planning services are among the core interventions of PMTCT provided to help women determine future child bearing patterns including the prevention of HIV-infected births. The low uptake of family planning seen in this study puts the majority of the HIV positive couples at increased risk.

### Conclusions

Findings from this studies show that, although the majority of women were offered HIV counseling, more than 30% did not receive HIV test. Women who tested positive did not have a CD4 test done, they were provided co-trimoxazole, multivitamins and sd NVP, while the use of HAART was limited for both mothers and babies. Babies born to HIV infected mothers were not tested for HIV using PCR/DNA and were not fed according to the national guidelines. The majority of women did not disclose their HIV status to their partners and condom use was limited despite their importance in the PMTCT strategy.

### Recommendations

1. All women should be encouraged to be tested for HIV during pregnancy and disclose their status to their partners.
2. CD4 counts should be mandatory and routine for all HIV positive mothers.
3. All exposed children should have their HIV status established early.
4. Use of more efficacious ARVs or HAART should be given to all mothers.
5. Research at national level involving more health facilities should be done to evaluate PMTCT services.

### Study limitations

This study was conducted in only one referral hospital

and involved only mothers who could access the facility. So it could not represent the whole Juba population.

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## UNICEF Infant and Young Child Feeding Counselling Card

On page 96 is Counselling Card number 22 from the set 'UNICEF Infant and Young Child Feeding: counselling cards for community workers'. It shows the risk of an HIV-positive mother passing the virus to her new baby if she and the baby take ARV and practice exclusive breastfeeding during the first 6 months (see article on page 81).

Image ©United Nations Children's Fund, New York, and Nutrition Policy Practice and the Center for Human Services of the University Research Co., LLC (URC/CHS).



# HIV and TB co-infection in South Sudan: a three year retrospective study

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## Abstract

### Objective

To determine the prevalence of HIV/TB co-infection among patients attending the HIV clinic at Juba Teaching Hospital (JTH) from 2011 to 2013.

### Method and Materials

This was a retrospective study using data abstracted from the registration book in the HIV clinic. A data sheet was used to collect relevant variables. Data were entered, organized and analyzed using SPSS Version 20 Software. A p-value of 0.05 or less was considered significant.

### Results

Out of 2,577 patients attending the HIV clinic in JTH from 2011 to 2013, 2,547 (99%) were included in this study. Of these, 27.4% were seen in 2011, 34.1% in 2012 and 38.5% in 2013. There were 1,010 (39.7%) males and 1,537 (60.3%) females with a male to female ratio of 2:3. The mean age (x, SD, range) was 30.8 +/-10.8 (0.2-68) years which for males was 33.3+/- 12.2 (1-68) years and 29.1+/-9.5 (0.2-65) years for females. There were 2,318 (91%) HIV mono-infected patients and 229 (9%) HIV/TB co-infected patients. There were 122 HIV/TB co-infected males and 107 females. 39.3% of patients with HIV/TB were aged 25-34 years, and 9.3% were aged 0-14 years. The p-value between the groups and within the groups was statistically significant at p= 0.005. Munuki payam had the highest percentage (31.7%) of HIV/TB co-infection.

### Conclusion

HIV/TB remains a major challenging health problem with a prevalence of 9%.

## Introduction

The re-appearance of tuberculosis (TB) in the era of global human immunodeficiency virus (HIV) epidemic is a threat to public health in high burden countries. These two diseases are causes of high mortality among infectious diseases [1]. In people living with HIV, tuberculosis is the leading cause of mortality. Globally, out of the 35.3 million people living with HIV, 12 million (33%) are infected with tuberculosis [2].

In 2011, it was estimated that 8.7 million new cases of TB and 2.5 million new cases of HIV were recorded [1, 3]. Of these new TB infections, 1.1 million (13%) were among people living with HIV [3]. Most of the burden of the dual HIV/TB co-infection is in Africa in which one-third of the approximated 2.3 million people who developed TB were HIV positive [1]. Of those with HIV/TB co-infection, 75% live in sub-Saharan Africa. Other regions

like India and Eastern Europe are also affected [4, 5].

The HIV epidemic is the main factor in the re-emergence of TB epidemic worldwide. One in eight new cases of TB occur in HIV positive individuals. The risk of developing active TB in HIV patients increases from 5 to 15% yearly depending on the level of the immune status [6, 7]. The risk of TB doubles within one year of HIV infection [8]. Hence people who are infected with HIV have increased susceptibility to active TB. This is because HIV modifies the pathogenesis of TB by increasing the risk of developing active TB in those with latent infection as well as in those newly exposed to TB. Up to 10% of people latently infected with TB will develop active TB in a population of HIV-uninfected people. But in an HIV positive population, there is 20 to 30 fold increase in relative risk of developing TB disease from latent infection relative to an HIV negative population [9].

**Table 1. Distribution (number and %) of sexes among patients attending the HIV clinic in JTH during 2011, 2012 and 2013**

Age group (years)	2011			2012			2013		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-14	12 (5%)	23 (5%)	35	31 (8.1%)	21 (4%)	52	34 (8.6%)	30 (5.1%)	64
15-24	<b>18 (8%)</b>	<b>101 (22%)</b>	119	25 (6.5%)	91 (19%)	116	18 (4.6%)	143 (24.4%)	161
25-34	88 (38%)	219 (47%)	307	158 (41.1%)	237 (50%)	395	163 (41.4%)	271 (46.2%)	434
35-44	74 (32%)	100 (21%)	174	115 (29.9%)	93 (19%)	208	121 (30.7%)	104 (17.7%)	225
45-54	25 (11%)	19 (4%)	44	41 (10.7%)	36 (7%)	77	46 (11.7%)	33 (5.6%)	79
55-64	<b>10 (4%)</b>	4 (0.8%)	14	11 (2.9%)	6 (1%)	17	10 (2.5%)	3 (0.5%)	13
65-74	5 (2%)	1 (0.2%)	6	3 (0.8%)	0 (0%)	3	2 (0.5%)	2 (0.3%)	4
<b>Total</b>	<b>232</b>	<b>467</b>	<b>699</b>	<b>384</b>	<b>484</b>	<b>868</b>	<b>394</b>	<b>586</b>	<b>980</b>

Several putative factors play an important role in the epidemiology of HIV infection in South Sudan:

- With the signing of a peace agreement in 2005, there has been a lot of rural-urban movement and travel between South Sudan and neighbouring countries with high HIV and TB rates.
- A high commercial sex workers presence in the towns [10].

Through a collaboration between the National Ministry of Health and the United Nation Development Programme (UNDP), a TB/HIV collaborative programme was developed for South Sudan. The objectives are to:

1. Establish a mechanism for collaboration between TB and HIV/AIDS programmes;
2. Decrease the burden of TB in people living with HIV and AIDS;
3. Decrease the burden of HIV in TB patients; and
4. Obtain political commitment to collaborative TB/HIV activities and create partnerships for development and collaboration [11].

Because of this collaboration, 29 coordinating bodies were formed for TB/HIV activities at all levels of the country. Likewise there are 140 TB/HIV service delivery points and 124 facilities that provide HIV voluntary counseling and testing and TB screening [11].

There is a paucity of published data on HIV/TB co-infection in South Sudan. The UNDP-SS has estimated the co-infection rate to be between 10-20%. An estimate in 2010 was 9.7% for TB/HIV co-infection patients and

**Table 2. Distribution of all patients according to their HIV or HIV/TB status, sex, age group and their p values**

Age/sex group	All patients	HIV only		HIV/TB		p value
		n	%	n	%	
<b>Total</b>	2,547	2318	91	229	9	0.000
<b>Male</b>	1,010	888	88	122	12	
<b>Female</b>	1,537	1430	93	107	7	
<b>0-14yrs</b>	151	130	86	21	14	0.005
<b>15-24yrs</b>	423	369	87	27	13	
<b>25-34yrs</b>	1,136	1046	92	90	8	
<b>35-44yrs</b>	607	554	91	53	9	
<b>45-54yrs</b>	200	173	86	27	14	
<b>55-64yrs</b>	44	37	84	7	16	
<b>65-74yrs</b>	13	9	69	4	31	

11.4% for all forms of TB [11]. We therefore undertook this study with the aim of establishing the prevalence of HIV/TB co-infection among HIV positive patients attending the HIV clinic at the Juba Teaching Hospital (JTH).

#### Materials and method

This was a retrospective study that involved the collection of variables from records at the HIV clinic at the Juba

Teaching Hospital.

We collected demographic data (age, sex and residential area), and the HIV and HIV/TB status of the patients who attended from January 2011 to December 2013. Included were all cases who had all these variables. A case was excluded if one of the variables was absent. Therefore out of 2,577 patients' records examined, only 2,547 were considered.

The information was collected into data sheets, verified and entered into SPSS Version 20 (IBM). Results were displayed in form of descriptive statistics and the Chi-square test was used to compare categorical data. A p-values of  $p < 0.05$  were considered to be statistically significant.

Ethical approval was obtained from the ethical committee in the National Ministry of Health.

## Results

Out of 2,577 patients attending the HIV clinic in JTH from 2011 to 2013, 2,547 (99%) were included in this study. Of these, 27.4% were seen in 2011, 34.1% in 2012 and 38.5% in 2013. There were 1,010 (39.7%) males and 1,537 (60.3%) females with a male to female ratio of 2:3. The mean age (x, SD, range) was 30.8 +/-10.8 (0.2-68) years in which for males was 33.3+/- 12.2 (1-68) years and 29.1+/-9.5 (0.2-65) years for females.

Table 1 shows the distribution of sex and age among patients attending the HIV clinic in 2011, 2012 and 2013.

Of the 2,547 patients 2,318 (91%) were HIV mono-infected and 229 (9%) were HIV/TB co-infected. Of the 229 HIV/TB co-infected patients, 122 were males and 107 were females. Table 2 and 3 show the distribution (number and %) of patients attending the HIV clinic at JTH according to their HIV or HIV/TB status, sex, and age group.

Figure 1 shows that:

- The majority (39%) of patients with HIV/TB belongs to the age group 25-34 years.
- 9% were in the age group of 0-14 years.

Table 4 shows that Muniki payam had the highest percentage (31.7%) of patients with HIV/TB co-infection.

**Table 3. Distribution (number and %) of the 2,547 HIV and HIV/TB patients by sex and age group**

Age/sex Group	HIV +ve			HIV/TB		
	Male (n %)	Female (n %)	Total	Male (n %)	Female (n %)	Total
0-14yrs	68 (7.7%)	62 (4.3%)	130 (5.6%)	9 (7.4%)	12 (11.2%)	21(9.2%)
15-24yrs	53 (6%)	316 (22.1%)	369(15.9%)	8 (6.6%)	19 (17.8%)	27(11.8%)
25-34yrs	361 (40.7%)	685 (47.9%)	1046(45.1%)	48 (39.3%)	42 (39.3%)	90(39.3%)
35-44yrs	279 (31.4%)	275 (19.2%)	554(23.9%)	31 (25.4%)	22 (20.6%)	53(23.1%)
45-54yrs	95 (10.7%)	78 (5.5%)	173(7.5%)	17 (13.9%)	10 (9.3%)	27(11.8%)
55-64yrs	26 (2.9%)	11 (0.8%)	37(1.6%)	5 (4.1%)	2 (1.9%)	7(3.1%)
65-74yrs	6 (0.7%)	3 (0.2%)	9(0.4%)	4 (3.3%)	0 (0%)	4(1.7%)
<b>Total</b>	<b>888</b>	<b>1430</b>	<b>2318</b>	<b>122</b>	<b>107</b>	<b>229</b>

## Discussion

Human immunodeficiency virus and tuberculosis are a major challenge in public health in many countries, where these conditions are endemic. In this study the prevalence of TB/HIV co-infection among patients who are HIV positive is 9%. This was similar to the UNDP-SS estimate of 2010 [11]. Studies in Nigeria showed a prevalence of 7.8% and in Tanzania a prevalence of 8.5% [12, 13] but lower than prevalences found in studies conducted in Northern Tanzania 30% [13], Cambodia 19.3% [14] and India 18.9% [15]. This variation may be due to the geographical and socio-economical status of the countries. It has been noted that tuberculosis is seen more in countries that are poor [16]. Our findings may not be representative of the whole of South Sudan because the data were collected from only one centre.

Among the 229 patients with HIV and TB co-infection, the proportion of co-infection according to sex was 12% (122/1010) for males and 7.5% (107/1430) for females. Studies conducted in Nigeria by Olaniran et al 2011 [17] and globally by Abeld et al 2002 [18] found similar results. Males have the tendency of migrating from one place to another searching for better work. As a result of this, they are in contact with more people increasing the chances of exposure to mycobacterium bacilli. It is worth mentioning that reactivation of TB is seen most commonly in patients with HIV/AIDS.

A statistically significant majority of the patients affected with HIV/TB co-infections belonged to the 25-34 year age group. However, the proportion of all 25-34 year old HIV-positive patients with the co-infection was 8% - the lowest of all the age groups. This result is in line with studies by Olaniran et al 2011 [17]. This age group usually has responsibilities which involve strenuous activities to meet socio-economical needs of their families. As such

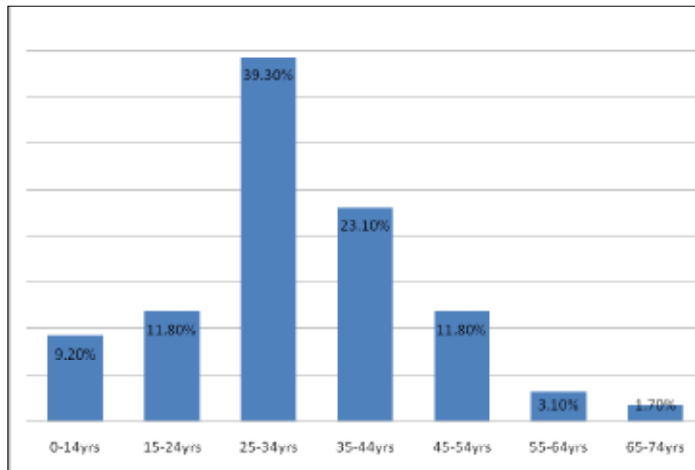


Figure 1. Distribution of HIV/TB co-infection of patients attending HIV clinic in JTH according to age group

they are more prone to associate with infected patients in one way or another. But in our study it seems they are less active and therefore they have less contact. This group reflects the reproductive and economic power of the nation. This may reflect prevalence of HIV/TB in the community since this is a sexually active group.

In our study children accounted for 9.2% of the 229 HIV/TB co-infected cases. Worldwide children contribute to 10% of HIV/TB infections although the prevalence varies from country to country. In South Africa the incidence of TB among children infected with HIV is 23% [19] and in London it is 5.5% [20]. In our study it is closely similar the global average and better than South Africa. This may be due to the fact that our study is based in one centre. Hence the results do not reflect prevalence of the whole country. It has been shown that with increase in coverage with anti-retroviral drugs, the incidence of TB decreases [21].

In our study a high proportion of HIV/TB cases were from Munuki payam (31.7%). This is because this payam is part of Juba City Council which has the largest (61%) number of inhabitants in comparison to all payams of Juba county. Furthermore urban life is associated with factors such as multiple sexual partners, sex workers, poor sanitation, overcrowding, and poor socioeconomic status, which can increase the likelihood of HIV/TB infection.

There is an increasing trend of HIV/TB co-infection over time in this study. Cases increased from 27.4% of all patients seen in the HIV clinic in 2011 to 38.5% in 2013. This is an increment of 11.1%. This may be due to socioeconomically instability as well as inter and intra tribal conflicts in the others parts of the country. So people tend to move to the capital for a better and safer life. Or it may be due to the fact that there is now a good public awareness programme that encourages the population to

Table 4. Distribution of HIV/TB co-infected patients attending the HIV clinic in JTH according to residence (states, counties and payams)

	n	%
<b>Juba City Council</b>		
Juba town	261	10
Kator	610	23.9
Munuki	807	31.7
<b>Other payams in Juba county</b>	530	20.8
<b>Elsewhere in Central Equatoria (CES)</b>	285	11.2
<b>Other States</b>	62	2.4

come forward for voluntary HIV testing.

In conclusion, HIV/TB still remains a major challenging health problem in this youngest nation with a prevalence of 9%. Males are more co-infected than females with the greatest number of co-infected patients being in the age group of 25-34 years.

#### Recommendations

1. Studies to document trends in HIV/TB co-infection should be implemented across the country.
2. All TB cases need to be screened for HIV so that HIV/TB is detected early and managed promptly.
3. Public awareness, community mobilization through different interventions should be encouraged and stepped up especially in areas where there is high prevalence of HIV and TB. This will help in the control and prevention of the dual co-infection which is challenging the health system.

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#### Conflicts of interest

There is no conflict of interest.

#### Contributors

All members participated and contributed equally in this research varying from literature review, questionnaire design, data collection, data entry, statistical analysis, typing, discussion and reviewing the manuscript.



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**Congratulations to three members of the SSMJ editorial board**

**Professor John Adwok Adieng** who has just been appointed Chairperson of the new 18-person South Sudan General Medical Council, and **Dr Edward Luka** who is appointed a member of the same Council.

Professor Adwok says, "It will not be an easy task to build this hitherto neglected pillar of our healthcare system. The establishment of a guiding regulatory body is the foundation of any system. It provides the base on which efficient and effective processes could be run by a dedicated and motivated team to ensure successful outcomes."

**Dr Eluzai Hakim** who has been nominated as **Clinical Educator of the Year for 2014** at St Mary's Hospital, Isle of Wight, UK, and whose name will be displayed on the hospital honours board.



# Prioritizing resources for treatment of HIV/AIDS in resource poor settings

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## Introduction and background

After two decades of war, South Sudan is facing a new challenge of having to deal with the AIDS epidemic. In 2010 an antenatal sentinel survey showed a national HIV prevalence of 3% [1]. It is estimated that about 230,000 people are living with HIV/AIDS and another 46,000 are urgently in need of antiretroviral therapy (ART) [2]. Prevalence among key populations is not clearly understood because of lack of data. UNAIDS has classified South Sudan as having a generalized epidemic [2].

Decades of civil war destroyed the health facility infrastructure, impeded development of the health workforce and diverted critical resources needed for health commodities such as ARVs and test kits for HIV. The current funding environment has enabled South Sudan to enroll only 4,600 people on ART. This represents coverage of only 9% of those in need of ART using a CD4 threshold of 300/ $\mu$ L [2]. This gap widens with a higher CD4 threshold. The low coverage is attributed to access constraints and lack of funds to procure and provide high quality ART. Currently there are a limited number of treatment centres in the country and these are often located far from villages making access impossible for many people.

Although not documented, mortality remains very high for those started on ART as most of them present very late due to multiple factors including stigma and discrimination. There is limited access to entry points into HIV care and treatment. Most hospitals and primary health centres do not offer testing and counselling (HTC) routinely to patients. In fact the current HTC programmes focus more on outreaches at market places and schools. HTC at health facilities in the form of provider initiated HIV testing and counselling (PITC) provides opportunity for most people to access treatment [3].

There is therefore an urgent need for a policy and institutional shift to implement programmes that provide high quality ART to people in need using the new WHO guidelines. This requires institutionalizing HIV testing and counselling in the form of Provider Initiated HIV testing and counselling and early treatment. However, previous investments have focused on awareness creation and vertical stand-alone HIV testing and counselling. The vertical system has resulted in a high leakage along the pathway of care as most people do not reach treatment centres.

## Benefits of ART at CD4 500/ $\mu$ L

The hallmark of any effective HIV/AIDS programme is preventing new infection, identifying those infected and providing ART to those in need. The primary objective of ART is to reduce morbidity, restore immunity and prevent death. Over the years the benchmark CD4 count for initiating ART has increased from 200/ $\mu$ L to 500/ $\mu$ L with profound benefits to the patient.

Early initiation of ART has significant benefits to the individuals. During HIV infection CD4 drops and viral counts increase with opportunistic infection appearing when CD4 drops to less than 200/ $\mu$ L [4]. This stage is also associated with direct impact of HIV on important organs including the central nervous system with resultant morbidity and mortality. It has been found that survival probability reduces exponentially with increasing clinical stage [5].

The 2010 WHO guidelines recommend starting treatment at CD4 350/ $\mu$ L or clinical stage 3 during which period opportunistic infections (OIs) would have emerged with devastating effects of the individual. Most important is tuberculosis which has far reaching effects on individuals, their family and the entire health sector. Kaposi's sarcoma is another OI that is common at CD4 of more than 200/ $\mu$ L.

The natural history of HIV infection involves the establishment of HIV infection, acute infection, chronic infection and symptomatic disease. Emergence of a new viral strain with severe compromise of host immune system and rapid increase in viral load is the hallmark of chronic infection. This has been associated with drug resistance mutation (DRM) even in ART naïve individuals. In fact the prevalence of DRM has been shown to be very high in a study that monitored resistance in Tanzania [6]. A similar study in South Africa highlights the impact of such resistance when transmitted to ART naïve patients [7]. DRM has been implicated for the current treatment failures seen in ART naïve patients with huge cost implication on the health sector and adverse impact on patients.

Late initiation of ART is also associated with the immune reconstitution inflammatory syndrome (IRIS) [8]. Tuberculosis has been the most notorious disease manifestation of IRIS with increased mortality in ART naïve individuals who start treatment at very low CD4 counts. IRIS remains difficult to detect because of the

lack of laboratory services [9].

### Adverse consequences of early ART

Early ART seems to confer huge benefits to individuals that dwarf its adverse effects. Although this is true most of the studies that follow patients for adverse events have taken place over a short period of time thus underestimating the actual long term effects of drugs. The new CD4 threshold of 500/ $\mu$ L means patients will take medicine for longer which may be associated with unknown severe side effects. Evidence is emerging from 6 years cohort studies in Switzerland about the magnitude of mortality associated with drug toxicity [10]. In this study, where 1,078 adults were followed for 6 years, clinical adverse reactions were observed in 45% while laboratory adverse effects were seen in 23%. Laboratory adverse effects carried a higher mortality. Although new ART regimens have fewer adverse effects the Swiss study provides insights into new challenges.

Another consequence of early initiation of ART in asymptomatic patient is the issue of adherence. For persons who feel perfectly well it is difficult for them to comprehend why they still need pills to stay healthy. Apart from just being healthy several factors affect an individual's adherence to ART including pill burden as well as their age, cognitive status and substance abuse. Although the new WHO guidelines recommend the use of efavirenz based single tablet once a day regimen [11], adherence still remains a challenge. Poor adherence to ART is associated with DMR and treatment failure increasing morbidity and mortality.

Sexual transmission of HIV is dependent on viral concentration in the infected host; early treatment is associated with less sexual transmission. Recent large cohort studies from KwaZulu Natal in South Africa have shown 'the risk of infection to an individual living in an area with ART coverage of 30-40% was 34% ( $p < 0.0001$ ) less than to an individual living in an area with ART coverage of less than 10%' [12]. In the HPTN 052 trial it has been shown that reducing the partner's viral load through ART administration significantly reduces the probability of their partner becoming infected [13]. The HPTN trial was conducted under controlled conditions of sexual partners who have revealed their status to their partners. This is different from real life situations of sexual mixing and migrations of persons.

A dramatic increase in CD4 levels and decreased viral loads associated with early initiation of ART results in fewer incidences of OIs. When individuals are kept healthy the community suffers less in terms of meeting hospital costs of treating OIs and staying at hospitals with bed-ridden relatives. There is also reduced emotional and psychological pain associated with caring for patients with chronic illness.

However all these gains may be hypothetical if emphasis

is placed only on initiating ART early without emphasis on adherence to treatment. This is because reduced viral loads and increased CD4 counts depend on adherence to ART. Adherence is a major challenge to ART with devastating consequences including DMR and treatment failures. Infection with new resistant viral strains is now a major concern [7].

The major implication of early ART is the total cost which is the sum of the costs of procuring antiretroviral drugs, outpatient costs, monitoring toxicity and patient health, and training health workers. The investment is therefore high in the beginning. When modelled using data from South Africa, it was found that starting ART at CD 500 / $\mu$ L not only reduces mortality and increases DALYs (Disability Adjusted Life Years) but was associated with up to \$5 billion saving in 40 years. It was also found that savings are higher with higher CD4 threshold at starting treatment [14]. It is therefore prudent to revise the CD4 threshold to 500 instead of merely increasing coverage at current CD4 threshold. Revising CD4 threshold to the new WHO guideline will thus save more lives although the initial investment cost may be high.

Other prevention methods, such as behaviour change and circumcision, have been encouraged but lack the power to reverse the epidemic as much as early ART initiation.

Although the benefits of early treatment are very tempting, caution needs to be exercised since these results are from mathematical modelling which are prone to errors. Data available from the South African modelling assume a well-functioning programme with adequate access to treatment, optimum adherence and retention on treatment. In the absence of these conditions the reversal of viral load with the resultant benefits may not be achieved.

### Country programme outline

Early ART initiation is an expensive upfront investment, but it is cost effective and is associated with reduced transmission of up to 92% [14]. It is therefore important for South Sudan to adopt rapidly the new WHO CD4 threshold for initiating ART. This requires training of current cadres on the new guidelines. The overall health system has to be re-structured to meet the needs of the many people at outpatients units who may need ART, including monitoring.

Revising CD4 threshold alone without addressing structural barriers to access will not push the country to realize the benefits of the new approach. Communities need to be sensitized and systems developed to support persons who need ART. This involves community mobilization and sustained behaviour change messages in order to create a demand.

Client initiated HIV testing and counselling (CITC) has been the traditional mode of entry into much needed HIV care and treatment programmes but uptake has been

low due to stigma and discrimination [3]. To ensure more people know their HIV status and gain access to care, PITC need to be promoted. PITC has been associated with increased uptake of HIV testing and since this happens in a structured health service patients are linked easily and faster to care and treatment services. PITC also identifies patients early during the course of the disease enabling them to access treatment at a higher CD4 levels compared to CITC [3].

There is particular need to re-structure the health system to be able to offer high quality ART including monitoring patients for adherence and retention. Without proper retention the gains postulated above could easily be lost due to emergence of viral mutations, treatment failures and consequent re-emergence of OIs that will quickly result in increased morbidity and mortality.

The switch to CD4 threshold  $<500/\mu\text{L}$  up from the current threshold of CD4  $<350/\mu\text{L}$ , will need training health cadres to provide high quality ART including monitoring for adherence, retention and adverse reactions in high volume clinics. This is because when access to treatment is less than 50% there is no benefit seen with early treatment.

### Conclusion

ART is associated with marked reduction in HIV transmission probability. The benefit of ART when started at higher a CD4 threshold is profound, not only to the individual but also to the community and the entire health sector. Mortality is reduced, health care cost is saved, freeing resources for other much need health services, and quality of life improved. Although most of the evidence comes from modelling and analysis based on ideal situations, there is still great confidence that huge gains will be achieved if programmes are improved to provide quality ART.

South Sudan needs to rethink its national strategy as a resource limited country with high aid dependency and map HIV expenditures for allocation and re-allocation of resources that support evidence based decisions. Now more than ever, South Sudan needs to act on its epidemic and give priority to the most effective programmatic services of which ART is one.

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# HIV infection and its effects on fracture healing: a literature review

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## Introduction

The Human Immunodeficiency Virus (HIV) is a virus that causes Acquired Immunodeficiency Syndrome (AIDS). The disease was discovered in 1983 in the Pasteur Institute, Paris by Barre and colleagues [1]. The causative agent is a Lentivirus, a subgroup of Retroviruses that is transmitted through body fluids. The main routes of entry include sexual intercourse, shared needles, and vertical transmission from mother to child during childbirth or breastfeeding. The World Health Organization (WHO) provides a staging system for HIV infection based on the clinical manifestations of the disease [2].

HIV/AIDS is encountered by orthopaedic surgeons when managing both orthopaedic and trauma cases. Cohen et al reported a prevalence rate of 16% amongst patients undergoing orthopaedic procedures in Zimbabwe [3]. HIV is also associated with a high incidence rate of Osteonecrosis. Chokotho et al evaluated the risk factors associated with the development of non-traumatic osteonecrosis of the femoral head in HIV positive and negative patients. They concluded that, together with other risk factors such as excessive alcohol intake, HIV infection contributes to the development of non-traumatic osteonecrosis of the femoral head [4]. Osteopenia is also known to be associated with HIV infection. Whether antiretroviral treatment contributes to this condition or not remains controversial [5]. It is therefore imperative that the surgeon familiarizes him/herself with the expected implications that the disease may have on the management of the patient. This paper focuses on the effects that the infection has on the healing process of open and closed fractures. It also attempts to explore the effects that HIV infection has on the operative treatment of fractures.

## HIV/AIDS in closed fractures

A closed fracture is defined as a fracture that does not disrupt the integrity of the surrounding skin [6]. There is a minimal risk of contamination in this type of fractures. HIV infection affects the rate of union in closed fractures.

Kamat et al conducted a study to evaluate the effects of HIV infection on fracture union. They studied a group of 2,376 patients with closed ankle fractures managed conservatively with below knee casts for a minimum of 6 weeks. The first group of 829 patients were HIV negative. The second group of 729 patients were HIV positive and

categorized between WHO clinical stages I and III. The third group of 755 HIV positive patients were categorized as WHO clinical stage IV. The study found that 12.45% of the patients with WHO clinical stage IV HIV had non-union compared to 1.5% and 1.25% for HIV negative and HIV stages I to III patients respectively. The study also revealed that fracture union is delayed in the third group of patients with the majority of this occurring at 8 weeks following injury. This is in contrast with the first and second groups of patients in which the majority of unions had occurred at 4 weeks after injury. The authors concluded that fracture union rates decreases with disease severity [7]. This discrepancy in union rates could be attributed to the fact that the infection alters the Cytokine environment in HIV positive patients. Cytokines are essential in fracture healing due to their role in the inflammatory phase of this process [8].

## HIV/AIDS in open fractures

Contrary to closed fractures, open fractures are fractures that disrupt the integrity of the overlying skin. This type of fractures is usually associated with infection as the compromised overlying skin provides a portal of entry for infectious agents. In HIV positive patients, open fractures are associated with complications in both wound healing and fracture union. In a prospective study conducted by Harrison et al, the outcome of open tibial fractures managed by surgical debridement and external fixation was compared between HIV positive and negative patients. Results of the study showed that 5 out of 7 HIV positive patients developed deep seated wound infection compared to 4 out of 21 in the HIV negative group. The same study also revealed reduced union rates among the HIV positive patients. 3 out of the 7 HIV positive patients had non united fractures at 6 months post injury compared to only 1 of the 27 HIV negative patients [9]. O'Brien and Denton concluded that the infection rates among HIV positive patients with open fractures treated by surgical debridement was higher compared to patients without HIV infection receiving the same treatment [10].

## Internal and external fracture fixation in HIV patients

The advent of fracture fixation represented a breakthrough in the care of trauma patients. Methods of fracture fixation are broadly classified as internal or external fixation. As defined by the American Association of Orthopaedic Surgeons [6]:

- Internal fixation is the surgical insertion of a device that stops motion across a fracture or joint to encourage bony healing or fusion.
- External fixation is the stabilization of a fracture or unstable joint by inserting pins into bone proximal and distal to the injury that are then attached to an external frame.

Several studies suggest that HIV is not a contraindication to internal fixation. Bahebeck et al concluded that, with prolonged preoperative prophylaxis and HAART therapy, surgical wound infection rates in HIV positive patients may approach that of uninfected patients [11]. D'Amico & Ballon-Landa compared two groups of immunocompromised patients undergoing surgery, a group of HIV positive patients and another of diabetes mellitus patients. The study concluded that perioperative infection rates are almost the same among HIV patients on HAART and patients with controlled diabetes mellitus [12]. Bates et al argued that HIV status does not affect the likelihood of the need for secondary orthopaedic procedures following internal fixation of fractures. They also concluded that such patients do not have an increased likelihood of developing chronic postoperative osteomyelitis [13]. However it is very important to preoperatively identify the risk factors in HIV positive patients. According to Abalo et al, the clinical stage of HIV positive patients undergoing surgery influences the outcome of their surgical procedures [14].

## Discussion

Untreated HIV infection delays, and sometimes prevents fracture union. The effects of the disease on fracture healing increases with the increase in its severity. It is also associated with higher infection rates of both surgical incision wounds and open fracture wounds. These complications are drastically reduced with better control of the disease through the administration of HAART. Preoperative antibiotic prophylaxis also plays a vital role in preventing postoperative infections in patients with fractures undergoing trauma procedures. With HAART and preoperative antibiotics, the orthopaedic surgical outcome of HIV positive patients approaches that of the general population.

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# If a woman is HIV infected...

What is the risk of HIV passing to her baby if both take ARVs and practise exclusive breastfeeding during the first 6 months?



Out of 100 babies born to HIV infected women who take ARVs:



The majority of babies (95 or more) are not infected with HIV.



Most of these babies (less than 2) become infected with HIV during pregnancy, labour and birth.



Breastfeeding babies (less than 3) can become infected. Exclusive and safer breastfeeding reduces the risk.

**Protect your baby –  
get tested and know your HIV status!**

Every effort has been made to ensure that the information and the drug names and doses quoted in this Journal are correct. However readers are advised to check information and doses before making prescriptions. Unless otherwise stated the doses quoted are for adults.