

Viral transfusion transmissible infections amongst blood donors in Maridi County Hospital, South Sudan

Dricile Ratib^{a,b}, Richard Laku^c, Umar Baba^d, Omer Yahya^e and Kim Picozzi^b

^a African Medical and Research Foundation, Juba, South Sudan.

^b Division of Pathway Medicine, School of Biomedical Science, University of Edinburgh.

^c Directorate of Policy, Planning and Budgeting, Ministry of Health Juba, Republic of South Sudan

^d Action Africa Help International – Nairobi, Kenya

^e Health Systems Strengthening Project, African Medical and Research Foundation – Hai Tong Piny-Juba Nabari - South Sudan

Correspondence: Dr Kim Picozzi kim.picozzi@ed.ac.uk

Introduction

The Republic of South Sudan gained independence in July 2011 after nearly two decades of civil war. The increase in cross border traffic following independence and the return of displaced nationals, may have unforeseen effects on the health of the population. The pattern of diseases across East Africa is defined by infectious conditions such as malaria and HIV. It has been suggested that the relocation of individuals from hyperendemic countries, such as Uganda, may influence the prevalence rates of these infections in South Sudan.

This research focused on the viral transfusion transmissible infections (VTTI), Hepatitis B and C, and HIV. Little is known about the level of these infections in South Sudan, although details from neighbouring countries would suggest that both HIV and Hepatitis B are endemic.

Objectives

To determine the prevalence of HBsAg, HCV and HIV among blood donors in Maridi between January 2007 and December 2011 and make recommendations on prevention and treatment options.

Methodology

This retrospective study reviewed the records of volunteer adult blood donors from the Maridi County Hospital laboratory from 2007-2011. Data was anonymised. The statistical analysis calculated 95% confidence intervals with significance taken as $p \leq 0.05$ using a Fishers Exact test.

Ethical approval for this research was provided by the ethical committee in the Office of the Director of Research, Monitoring and Evaluation, Ministry of Health, which was shared with the State Ministry of Health and the County Health Department.

Setting

Maridi County borders the Democratic Republic of Congo to the south. The projected population of Maridi

is 108,629 based on the 2008 national population census results (with 3% annual population growth and returnees factored in). The population is served by a network of 3 Primary Health Care Centres (PHCCs), twenty Primary Health Care Units (PHCUs) and by Maridi County hospital. Maridi hospital admits 4,000-5,000 patients annually. Admissions are triaged to assess the need for a blood transfusion, with common causes being injury, anaemia attributed to malaria and obstetric emergencies.

There is no blood bank in Maridi hospital. A blood donation is requested from the family when the haemoglobin is below 4g/dl without any other symptoms or 4-6g/dl with clinical features of hypoxia, acidosis, hyperparasitaemia of more than 20% and impaired consciousness [1]. Following standard safety procedures¹ the preliminary donation is made onsite before the sample is cross-matched for blood type, only those compatible samples are then screened for viral infections.

A number of rapid serological tests for transfusion transmissible viral infections are available onsite, supplied by the United Nations Development Programme (UNDP) under the Global Fund. These tests include the Hepatitis B surface antigen (HBsAg) rapid Dip-strip (Acon Laboratories Inc), Hepatitis C virus (HCV) rapid test (Span Diagnostics, Ltd), Determine HIV1/2 test strips (Alere Medical Co.) and UniGold HIV1/2 (Trinity Biotech Plc). All compatible blood samples are screened with all four tests, and only those deemed to be safe and uninfected are utilised for the transfusion.

Results

Over the 5 years (2007-2011) 324 individuals received a blood transfusion. The most common recipients were

¹ These safety procedures refer to the small preliminary donation made on site. This is firstly cross-matched for compatibility with the intended recipient, if the donor is suitable the blood sample is then screened for the listed infectious agents. It is only those individuals who are clear of infection and compatible with the recipient who are called upon for a larger collection for the purpose of transfusion.

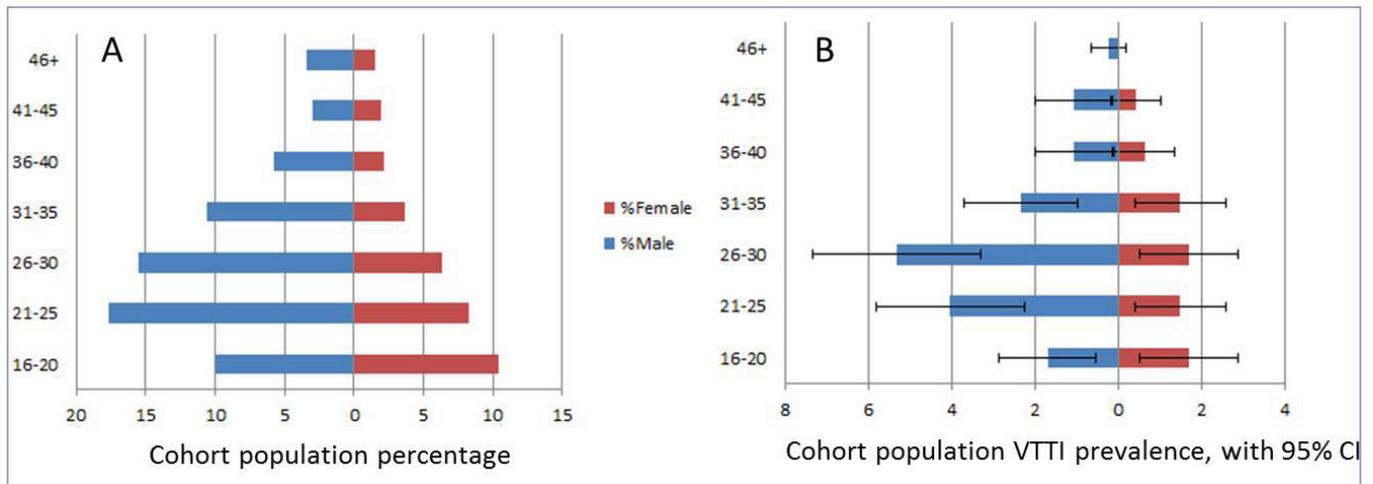


Figure 1: Population pyramids (a) for the blood donation cohort of know age (n=471), (b) based on the population VTTI prevalence with 95% confidence intervals.

children under the age of five (183/324) and women over 16 years of age (80/324).

In the same time period, records exist for 496 blood donations. The mean age of donors was 28 years (range of 16-58) (Figure 1a). The representation of the different blood groups, rounded to the nearest decimal point was A 26.4%; B 15.7%; AB 1.4% and O 56.4%. Men were more likely to donate than women (322/496).

Within this donor population 110/496 donors were found to be infected with antigens for at least one VTTI, of which 13 were mixed infections (11.8%, 95% confidence interval (CI) = 5.8-17.8%) and 97 were single infections (88.2%, CI = 82.1-94.2%), no triple infections were detected (see Figure 2). In terms of diagnostic events, Hepatitis C seropositivity was 9.3% (CI = 6.7-11.8%), Hepatitis B surface antigen at 8.9% (CI = 6.4-11.4%) and HIV at 6.7% (CI = 4.5-8.8%), see Figure 2.

The prevalence of transfusion transmissible infections in male blood donors was 74/322 (23.0%, CI = 18.3-27.6%) compared to 36/174 (20.7%, CI = 14.7-26.7%) in female donors, however there is no significant difference between the sexes (Fishers exact test, $p=0.57$). In terms of age analysis, 25 individuals were discounted as the age was not recorded, one of these was found to have antigens for HCV. Of the remaining cohort two thirds (77/109) of the infections were among the age bracket of 21-35 years (see Figure 1b), no statistical differences occurred between the genders at any age group.

Discussion

The age of blood donors seems to be weighted towards those individuals of less than 40 years of age. This distribution is in keeping with that of the country's population structure more generally where prolonged civil unrest has left 79% of the population being less

than 30 years old [2]. The demography of blood group distribution within the studied population is not dissimilar to the most recent information available from Sudan, the main differences being due to the low representation of AB (1.4 %) compared to a country wide average of 7% [3].

Of the 496 blood donors, only 174 were females. This gender bias may reflect that one of the main conditions requiring a blood transfusion was a complication of child birth. The immediate donors are usually the spouse which may address why the number of male blood donors is higher than females. Culturally and socially, it is also reported to be more acceptable for the blood donation to be made by a male member of the family [4].

HIV was reported at 6.7%. This is twice the national average reported from antenatal clinics (ANC) across the country in 2009 [5], and is similar to findings from the 2011 National HIV indicator survey from Uganda [6]. Information from the Western Equatoria State also indicate an increase in the recorded occurrence of HIV. A study in 2012 from ANC and voluntary counselling and testing facilities reported a seropositivity of 12.1% (CI = 9.6-14.1%) [7].

Sudan has been classified as a country with high endemicity of Hepatitis B virus (HBV), historically rated at 8% in 1996 by the World Health Organisation [8]. In keeping with our findings the situation appears largely unchanged with the seroprevalence in eastern Sudan reported at 8.2% (n = 376) [9], 5.1% in the north of the country [10] and 5.6% in the central regions [11]. However caution has been urged regarding the sole reliance on HBsAg for the detection of this infectious agent, with an increased sensitivity reported when the core antigen is used as a the diagnostic target [12].

The seroprevalence of Hepatitis C found in this study is

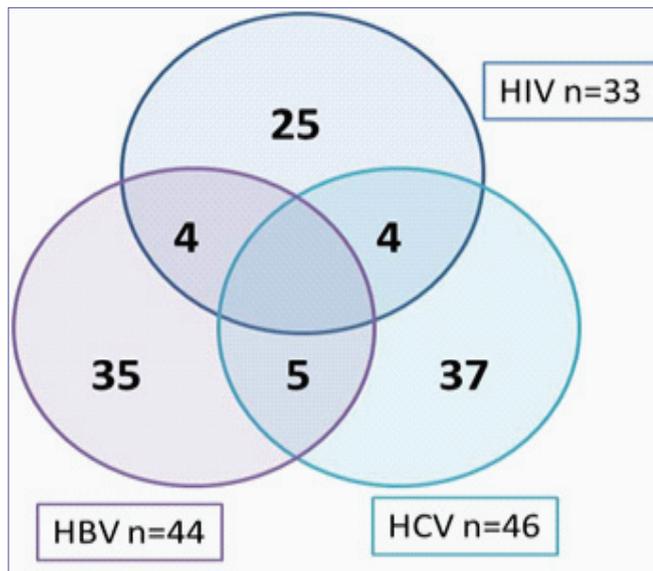


Figure 2. The distribution of single and mixed infections of transfusion transmissible viral infections as detected within specified blood donating cohort of this study (n=496)

significantly higher than that of previous reports (Fishers exact test, $p < 0.0001$), for example in South Darfur state in 2009 the detected prevalence amongst 400 male blood donors was 0.65% [4], while in southern Sudan 3% of 666 outpatients subjects were positive for anti-HCV antibodies [13]. Unpublished work reported suggests a seroprevalence in asymptomatic blood donors of 4.4%, but no other details are forthcoming [14].

It is too early to determine if the disease landscape will alter in South Sudan with the return of peace. However, this research provides a useful baseline upon which to base further studies, and highlights the need for awareness of the risk of transmission. The elevated level of HCV within this studied population highlights the need for further investigation, while HBV prevalence can be targeted with the incorporation of vaccination into the routine expanded programme of immunisation across the country.

Conclusion

This study provides an insight into the prevalence of these viral infections within the community local to Maridi hospital. It reaffirms the need for continued surveillance of blood donations prior to use. Sustained health care promotion, the availability of treatment, health promotion and appropriate management must be ensured to prevent the further transmission of these infections.

References

1. WHO 2002. The clinical use of blood. Handbook. Blood

transfusion safety, Geneva.

2. National Bureau of Statistics. South Sudan Statistical Yearbook 2011, National Bureau of Statistics.
3. Khalil, I. A., S. Phrykian and A. D. Farr (1989). "Blood group distribution in Sudan." *Gene Geogr* 3(1): 7-10.
4. Abou, M. A., Y. M. Eltahir and A. S. Ali (2009). "Seroprevalence of hepatitis B virus and hepatitis C virus among blood donors in Nyala, South Dar Fur, Sudan." *Virol J* 6: 146.
5. Jervase, A. (2011). "HIV prevalence in South Sudan: data from the ANC sentinel surveillance 2009." *South Sudan Medical Journal* 4: 49-56.
6. International., U. M. o. H. a. I. (2012). 2011 Uganda AIDS Indicator Survey: Key Findings. Calverton, Maryland, USA, MOH and ICF International.
7. Baba, S. P., A. Jervase, M. St Louise, E. K. Dokubo and K. Clarke (2013). "Notes from the field: Investigation of high HIV prevalence in Western Equatoria State-South Sudan, 2012." *Morbidity and Mortality Weekly Report* 62(22): 453-454.
8. WHO Expanded program on immunization, hepatitis B vaccine, making global progress: EPI update. 1996. Geneva, Switzerland, *The World Health Organization*.
9. Abdallah, T. M., M. H. Mohamed and A. A. AbdelAzim (2011). "Seroprevalence and epidemiological factors of hepatitis B virus (HBV) infection in Eastern Sudan." *International Journal of Medicine and Medical Sciences* 3(7): 239-241.
10. Nagi, A. M., H. A. Altyeb and A. M. Ahmed (2007). "Seroprevalence of Hepatitis B and C Viral Infections among blood donors in Shendi, River Nile State, Sudan." *Research Journal of Medicine and Medical Sciences* 2: 122-126.
11. Nakwagala, F. N. and M. M. Kagimu (2002). "Hepatitis B virus and hiv infections among patients in Mulago hospital." *East Afr Med J* 79(2): 68-72.
12. Mahmoud, O. A., A. A. Ghazal, S. Metwally Del, A. M. Elnour and G. E. Yousif (2013). "Detection of occult hepatitis B virus infection among blood donors in Sudan." *J Egypt Public Health Assoc* 88(1): 14-18.
13. McCarthy, M. C., A. El-Tigani, I. O. Khalid and K. C. Hyams (1994). "Hepatitis B and C in Juba, southern Sudan: results of a serosurvey." *Trans R. Soc Trop Med Hyg* 88(5): 534-536.
14. Mudawi, H. M. (2008). "Epidemiology of viral hepatitis in Sudan." *Clin Exp Gastroenterol* 1: 9-13.