THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

Transfusion Transmissible Infections Among Voluntary Blood Donors at the Lusaka Blood Transfusion Centre, Zambia, 2012

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Dissertation Submitted to the University of Zambia in Partial Fulfilment of the Requirements of the Degree of Master of Public Health (MPH)

The University of Zambia

Lusaka

2015

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ABSTRACT

Background:
HIV1&2, HBsAg, anti-HCV and syphilis antibody are mandatory disease marker tests of Transfusion Transmissible Infections (TTIs) conducted on every donated unit of blood in Zambia. Blood is donated by first time voluntary donors and repeat/regular donors of different ages. Both categories undergo the same screening eligibility criteria in the form of medical history and physical examination prior to blood donation. Units, which test positive for any of the four TTIs, are discarded. The cost of producing one unit of blood in Zambia is about US$40 and there is need to keep the discard rate to a minimum. The study aimed at finding out which sub-category of donors was responsible for the discards at the Lusaka Blood Transfusion Centre and conversely which was the safest.

Methodology: A cross-sectional study involving a retrospective review of all blood donors and screening records of voluntary non-remunerated donors at the Lusaka Province/UTH Blood Transfusion Centre covering the period of January to December 2012. For each unit of donated blood, information on donor age, gender, whether first or repeat donor and test result of disease marker of the four TTIs was entered in a spreadsheet and subjected to descriptive and inferential analysis.

Results: Of the 16,027 units donated in 2012, 11,516 (71.9%) were from males, and the majority (77.8%) were aged between 16-24 years. The proportion of first time donors was 60.4%. The overall discard rate due to TTIs was 10.1% (1,622). Most were for a single disease marker positivity (1526, 94.1%). Disease marker positivity for HIV, Hepatitis B, Hepatitis C and Syphilis was: 2.9%, 6.0%, 0.6%, and 1.2% respectively. Using multivariate logistic regression, the safest donors (i.e. with a useable unit not discarded due to a TTI) were females (OR 1.25, 95% CI 1.11-1.41), repeat donors (OR 1.37, 95% CI 1.23-1.53), and those in the age category 16-24 years (OR 2.35, 95% CI 1.95-2.84).

Conclusions: Repeat/regular, female, young (16-24 years of age), voluntary blood donors were the safest source tested at the UTH/Lusaka Province Blood Transfusion Centre in 2012. Hepatitis B remains the most common TTI as a cause for discard and points to the need for adequate prevention strategies. There is a small but significant discard rate due to hepatitis C. The overall 10.1% discard rate due to TTIs suggests a need to consider safe donor retention strategies as drivers for the blood transfusion program in Zambia.

ACKNOWLEDGEMENTS

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ABBREVIATIONS

ABO   ABO blood group system; most clinically significant blood group system

HIV   Human Immuno deficiency Virus

HBV   Hepatitis B Virus

HCV   Hepatitis C Virus

MOH   Ministry of Health

Rh D   Rhesus D blood group; the second most clinically significant blood group system

TTIs   Transfusion Transmissible Infections (includes HIV, HBV, HCV and Syphilis

WHO   World Health Organization

ZNBTS   Zambia National Blood Transfusion Service

DEDICATION

The Love of God is more than tongue can tell. I dedicate this work to my late father and mother who taught me to walk in the path of righteousness before God and to believe in hard work as a way of success. To my beloved wife Lwizya and to my children David Junior, Chibale and Chiwanza for their understanding as I denied them my presence for a good cause during the time I spent working on my studies and dissertation.

1.0 INTRODUCTION

1.1 Blood safety

The safety of blood and its products has gained tremendous importance since the documentation of blood borne viral infections in regularly transfused patients. These may be thalassemia children, oncology patients or aplastic anaemia patients. Safe blood transfusion is the term which refers to judicial and rational therapeutic use of blood and blood products. World Health Organization (WHO) recommendation of safe blood transfusion is provision of compatible blood which is cross matched and had been screened at least for five WHO recommended transfusion transmitted infections; human immunodeficiency virus (HIV), hepatitis C (HCV),hepatitis B (HBV), syphilis and malaria parasite (Shah et al, 2010). Therefore, the seropositivity of disease markers in the donated blood is an indicator of degree of microbiological safety of blood (Heyns, 2011). Therefore blood safety is directly influenced by the type of blood donor. There are two types of voluntary blood donors: First time voluntary non-remunerated blood donors and repeat/regular non-remunerated blood donors. No person is coerced to donate blood and no-one is remunerated. Blood donors from both categories of blood donors are subjected to the same medical questionnaire as selection criteria prior to donating blood. The donated blood is mandatorily subjected to laboratory tests in accordance with the WHO and other international best practices (WHO, 2011). The blood is tested using the HIV antigen/antibody test, Hepatitis B surface antigen test, anti-HCV antibody test and syphilis test. The testing platform in the Laboratories is the ABBOTT architect fully automated blood testing system applying chemiluminiscence. All units of blood which test positive for any or all of the disease markers (transfusion transmissible infections – TTIs) are discarded in accordance with applicable bio-safety protocols. The units of blood which test negative for disease markers are placed in inventory and distributed to transfusion outlets mainly provincial and district hospitals where cross matches are done and blood issued to patients.

The WHO recommends that if 1% of the population donated blood, the country would be self sufficient in blood (WHO, 2011). However, achieving this aim can be jeopardized if the donated blood is discarded due to HIV and other transfusion transmitted infections (TTIs) such as Hepatitis B, Hepatitis C and Syphilis. Other researchers have reported on seroprevalence globally, regionally and locally. For example, in Europe by 2004 the reported HIV prevalence levels were lower than 10/100 000 donations. The prevalence of HIV, Hepatitis B, Hepatitis C and Syphilis was much lower among donations from repeat donors than from first-time donors (Murphy et al, 2010). In the United States of America (USA), HIV infection amongst blood donors between 1985 and 1988 in first time donors was 0.039% (0.063% for men and 0.014% for women). For repeat donors HIV seropositivity was 0.012% (0.018% for men and 0.003% for women).

In South Africa, a study on the prevalence of HIV-1 in blood donations revealed that the prevalence of HIV-1 in blood donations declined from 0.17% in 1999-2000 to 0.08% in 2001-2002 after the implementation of the new donor selection and education policy (Heyns, 2000). The number of high-risk donations collected decreased from 2.6% to 1.7%, and the likelihood of these donations being infected decreased from 4.8% to 3.25%. The likelihood of first-time donors being recently infected with HIV-1 decreased from 18% to 14% and respective incidence of high-risk donations collected decreased from 2.6% to 1.7%. In Zambia, the total national crude sero-prevalence in 2011 amongst blood donors for combined TTIs was 10.0% (ZNBTS, 2012) with HIV contributing 4%, HBSAg 6%, HCV 1% and syphilis 0.5%. However, data stratified by donor characteristics were not assessed (ZNBTS, 2012). This study aimed to do so.

1.2 Problem Statement

TTIs are prevalent in the voluntary blood donors in Lusaka. The reactive units of blood are discarded and this is a waste of resources as the cost of production of a single unit of safe blood in Zambia is around US$40 (ZNBTS, 2012). It is unclear what the TTI seroprevalence rates are in the general pool of voluntary blood donors at the Lusaka/UTH blood transfusion center. Further, the characteristics of donors whose blood is discarded compared to being useable is not known and can have implications for adapting the screening process.

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1.3 Justification

Studies in several countries show that there is an apparent difference in rates of TTI in first time/repeat donors; whether they are male/female or of a certain age category. Therefore, there was need for exploration of which subcategory accounted for high TTI prevalences at Lusaka Blood centre and see if the outcome would be useful in policy formulation for improved blood safety. Information on HIV, Hepatitis B, Hepatitis C and Syphilis seroprevalence rates among different subcategories of voluntary blood donors would form the basis for future balanced preferential choice of which type of blood donors to rely upon as a source of sustainable safe blood for transfusion in Zambia. This would inevitably result in less units of blood being discarded inherently reducing on the residual risk. As less units of blood are discarded this improves stock levels of useable blood leading to the distal outcome of reduced mortality in patients in need of haemotherapy who otherwise would have died due to non availability of sufficient blood stocks.

1.4 Research Question

What are the donor characteristics (male/female; different age categories; first time voluntary donors/voluntary repeat) associated with the highest discard rate at the Lusaka Province/UTH Blood Transfusion Centre?

1.5 Objectives

1.5.1 General Objective

To determine the extent of Transfusion Transmissible Infections among voluntary blood donors at the UTH/Lusaka Blood Centre.

1.5.2 Specific Objectives

1 To determine the seroprevalence of Transfusion Transmissible Infections (TTIs) (HIV, Hepatitis B, Hepatitis C and Syphilis) among first time voluntary blood donors and repeat voluntary blood donors tested at the Lusaka Province/UTH Blood Transfusion Centre.

2 To assess demographic characteristics of voluntary blood donors with TTIs.

2.0 BACKGROUND

2.1 Global epidemiology of transfusion transmissible infections

In Europe, between 1996 and 2004, the reported national HIV prevalence levels were lower than 10/100 000 donations. The prevalence of HIV, Hepatitis B, Hepatitis C and Syphilis was much lower among donations from repeat donors than from first-time donors (Murphy et al, 2010). In a study to determine HIV seroprevalence and other TTIs among different categories of blood donors in Kathmandu, Nepal, it was found that HIV and HBV prevalence was relatively high among first time donors compared to repeat regular blood donors (Shrestha et al, 2009). In a study on HIV prevalence among blood donors in a blood bank in Curitiba (Brazil), results indicated that the prevalence of HIV among blood donors was 0.149% (0.155% among men and 0.132% among women). The frequency of HIV was statistically identical among new blood donors and repeat donors (Andrade et al, 2002). In a 4-year study (2004-2007) aimed at determining the prevalence of serological markers of HBV, HCV and HIV in the population of blood donors in Izmir, Turkey, results showed that prevalence rates for all TTIs were generally lower in the blood donor population compared to the general public (Afsar et al, 2008). The study did not however attempt to sub categorize blood donor types therefore did not highlight which one category either by gender, age or donor type really contributed to the lowered prevalence rates. As for HIV specifically, the crude prevalence rate was found to be less than 1%

In the United States of America (USA) HIV surveillance program, HIV infection amongst blood donors gives a trend in HIV prevalence and incidence within specific demographic subgroups such as first time and repeat donors. From April 1985 to September 1988, HIV in first time was 0.039% (0.063% for men and 0.014% for women). For repeat donors HIV seropositivity was 0.012% (0.018% for men and 0.003% for women) HIV prevalence in first time was higher than HIV incidence in repeat donors (Dondero et al, 1988). The risk for acquiring HIV infection through blood transfusion was estimated conservatively to be one in 1.5 million, based on 2007--2008 data (Zou et al, 2010). The prevalence of T. pallidum seropositivity and active syphilis in first time donors was 162.6 (95% CI 145.5-

181.2) per 100,000 donors and 15.8 (95% CI 10.8-22.3) per 100,000 donors, respectively. (Kane et al, 2015).

2.2 Regional epidemiology of transfusion transmissible infections

In Burkina Faso, a study to determine the prevalence rates of HIV, Hepatitis B, Hepatitis C and syphilis among blood donors revealed that Hepatitis B and Hepatitis C were more prevalent than HIV (Kania et al, 2009). In a study to determine the seroprevalence of HIV and other Transfusion Transmissible Infections among prospective blood donors at a general hospital in Otukpo, (an urban area of Benue State, in the Middle Belt of Nigeria.) a total of 2,500 samples were screened for HIV over the three – year period. The seropositivity rate was found to be 12% amongst blood donors. The study stratified blood donors by gender and age but did not categorize the donors into voluntary and family donors. Further, information was missing to indicate whether they were first time donors or repeat donors (Alao and Okwori, 2009). In South Africa, a study on the prevalence of HIV-1 in blood donations following implementation of a Structured Blood Safety Policy in South Africa revealed that the prevalence of HIV-1 in blood donations declined from 0.17% in 1999-2000 to 0.08% in 2001-2002 after the implementation of the new donor selection and education policy (Heyns, 2000). The number of high-risk donations collected decreased from 2.6% to 1.7%, and the likelihood of these donations being infected decreased from 4.8% to 3.25%. The likelihood of first-time donors being recently infected with HIV-1 decreased from 18% to 14% and respective incidence of high-risk donations collected decreased from 2.6% to 1.7%. Donations from the majority black population declined from 6.6% to 4.2%. This elaborate study however, did not categorically reveal which category of voluntary donors contributed significantly or insignificantly to the mean prevalence rate of HIV amongst blood donors. (Heyns, 2000)

2.3 Local epidemiology of transfusion transmissible infections

In Zambia, based on 2011 data from the Zambia National Blood Transfusion Service (ZNBTS) the national crude discard rates for blood was 10.0% (HIV 4%, HBSAg 6%, HCV 1% and syphilis 0.5%) (ZNBTS, 2012). The statistics are crude rates derived from first time voluntary and repeat voluntary donors combined. What is not clear is how much the subcategories of voluntary donors contribute in terms of discard rates.

3.0 RESEARCH METHODOLOGY

3.1 Study Design

The study was a retrospective cross sectional study that involved review of voluntary Blood donor records and TTI screening records at UTH Blood Transfusion centre covering the period from January 2012 to December 2012

3.2 Study site and population

The study was conducted at Lusaka Blood Transfusion Centre, Zambia

3.3 Sampling and Sample Size

This was a non-probability, census type of sample size. All records for donations from voluntary non-remunerated blood donors between January 2012 and December 2012 were available and included for analysis. The eligibility criteria to be included in the sample frame required data to be available for the following:

Inclusion criteria:

1   First time voluntary donors
2   Repeat/Regular voluntary donors
3   Units collected by Lusaka Provincial blood transfusion team only and where tested on fully automated Abbott architect immuno analyser.

Exclusion Criteria:

1   Units collected jointly by Lusaka and other provincial teams
2   Units donated by therapeutic donors
3   Units donated by directed or relative donors

3.4 Data Extraction techniques

Study Procedure: Blood donation and testing records from January 2012 to December 2012 were collected by the researcher from the registry of the Lusaka Province/UTH Blood Transfusion Centre. The following Blood donor and Laboratory records were reviewed as source data:

- Blood Donor Log books
- Individual blood Donor records
- TTI testing records
- Unit labelling records

For each unit of donated blood, information on donor age, gender, whether first of repeat donor and test result of disease marker was entered in an Excel spreadsheet. The proforma is shown in Appendix 1. This was then exported to SPSS version 14 for descriptive and inferential analysis (described in the next section). The independent and dependent variables are described below.

3.4 Data Analysis

Throughout the analysis, **'discard'** and **'useable'** were used as the inverse of each other. Any unit of blood with any of the TTIs with a positive result was considered **'discarded'.**

Descriptive analysis: This was by way of tabulations by donor characteristics and disease marker positivity, discard rate.

Inferential analysis:

The **independent variables** were:

- type of donor (first time or repeat)
- gender, and age (within categories).

The **dependent variable** was useable unit (i.e. non-discard). (Inverse being non-useable or discard).

Chi square was used to test the association (unadjusted odds ratios) of donor characteristics with discard.

A multivariate logistic regression model was developed to control for confounders related to donor characteristics and outcome (discard/useable donor unit). Results presented as unadjusted odds ratios, 95% confidence interval (and corresponding P-value.

3.5 Ethical Considerations

Permission to conduct this study was obtained from the Zambia National Blood Transfusion Service. Ethical approval was obtained from the University of Zambia Biomedical Research Ethics Committee. In order to uphold confidentiality, no personal identifiers were used.

4.0 RESULTS

Result 1: Overall discard rate

A total of 16,027 units of blood were collected from voluntary non-remunerated blood donors by the Lusaka Provincial Blood transfusion Centre team. Of these, 1,622 units were discarded due to the presence of any of the TTIs. This gave a crude discard rate of 10.1% (Table 1).

Most (94.1%) of the discarded units were positive to only one (1) of the four (4) TTIs. The remaining discarded units (5.9%) were positive to two or more of the four TTI markers (co infections) (see Table 2)

Table 1: Total donor units and discard rate (any reason)
Lusaka Province Blood Transfusion Centre - 2012

Total donor units	**16,027**		
Total # discarded	**1622**		
Discard rate	**10.1%**		
single reason for discard		**1526**	**94.1%**
multiple reason for discard*		**96**	**5.9%**
any reason for discard		**1622**	**100.0%**
*more than one disease marker positive			

Single infection and co-infection

Of the 1622 units discarded, the single reason indications were HIV positive (n=381), HBV positive (n=917), HCV positive (n=80) and RPR positive (n=148). These made a total of 1,526 units that were discarded (94.1% of all discards) and attributable to a single infection.

Similarly, a total of 96 units were discarded (5.9%) due to co-infections of two or more diseases. The proportions show that as a single reason for discard, HBV was the commonest (56.5%), followed by HIV (23.5%), syphilis (9.1%) and HCV (4.9%). The remaining few (5.9% total) were co-infections. (Table 2).

Table 2. Single infection and co-infection as a reason for discard

Reason for discard	HIV Pos	HBV Pos	HCV Pos	Syphilis Pos	Donor units discarded	Percent of discard
	n	n	n	n	n	%
Single reason for discard – HIV	381				381	23.5
Co-infection with HIV, HBV and syphilis	1	1		1	1	0.1
Co-infection with HIV and HBV	34	34			34	2.1
Co-infection with HIV, HCV and syphilis	1		1	1	1	0.1
Co-infection with HIV and HCV	3		3		3	0.2
Co-infection with HIV and syphilis	39			39	39	2.4
Single reason for discard – HBV		917			917	56.5
Co-infection with HBV and HCV		8	8		8	0.5
Co-infection with HBV and syphilis		9		9	9	0.6
Single reason for discard – HCV			80		80	4.9
Co-infection with HCV and syphilis			1	1	1	0.1
Single reason for discard - Syphilis				148	148	9.1
Total discards	459	969	93	199	1,622	100.0

Result 2: Donor characteristics and disease marker positivity

Analysis of TTI/disease marker positivity per donor characteristics as shown in table 2 revealed that: there were slightly more first compared to repeat donors (60.4% vs. 39.6%); almost three quarters were male (71.9%); and over three quarters were in the younger age group of 16-24 years (77.8%).

When donor type was stratified by disease positivity, HIV positivity was 3.5% amongst first time blood donors and 1.8% amongst repeat blood donors. HBV positivity showed little difference between the first and repeat blood donors (6.0% vs. 6.2%). HCV positivity showed minimal difference between the first and repeat blood donors (0.5% vs. 0.6%). The corresponding syphilis rates were 1.8 vs. 0.4 showing a higher proportion amongst first time donors.

Similarly, gender and age categories are stratified by disease positivity and presented in table 3. There were no marked discrepancies noted.

Table 3. Donor characteristics, disease marker positivity, Lusaka Province Blood Transfusion Centre, 2012

Donor type	n	%	HIV Pos		HBV Pos		HCV Pos		RPR Pos	
First	9,681	60.4	342	3.5%	577	6.0%	52	0.5%	175	1.8%
repeat	6,346	39.6	117	1.8%	392	6.2%	41	0.6%	24	0.4%
all	**16,027**	100.0	**459**	2.9%	**969**	6.0%	**93**	0.6%	**199**	1.2%

Gender	n	%	HIV Pos		HBV Pos		HCV Pos		RPR Pos	
male	11,516	71.9	320	2.8%	775	6.7%	66	0.6%	140	1.2%
female	4,511	28.1	139	3.1%	194	4.3%	27	0.6%	59	1.3%
all	**16,027**	100.0	**459**	2.9%	**969**	6.0%	**93**	0.6%	**199**	1.2%

Age (yrs)	n	%	HIV Pos		HBV Pos		HCV Pos		RPR Pos	
16-24	12,472	77.8	210	1.7%	755	6.1%	80	0.6%	52	0.4%
25-34	2,185	13.6	158	7.2%	143	6.5%	8	0.4%	71	3.2%
35-44	1,236	7.7	86	7.0%	66	5.3%	4	0.3%	69	5.6%
45-54	31	0.2	2	6.5%	1	3.2%	0	0.0%	3	9.7%
55+	103	0.6	3	2.9%	4	3.9%	1	1.0%	4	3.9%
all	**16,027**	100.0	**459**	2.9%	**969**	6.0%	**93**	0.6%	**199**	1.2%

Result 3. Discard rates by Donor characteristics

Further analysis within donor characteristics revealed consistently lower positivity in all disease markers in repeat blood donors compared to first time blood donors (Table 3). Of the 1,622 units discarded 65.8% were first time donors and 34.2% were repeat donors. The 1,067 units discarded from first time donors were 6.7% of all 16,027 units donated. Within first time donors, 1,067 units out of 9,681 units were discarded (11.0%).

The same held true for gender in which males had a greater proportion of discard. TTI

Considering age, most of the discards were from the 16-24 year age category since they were also the largest group. However, they had the least discard rate (8.5%) compared to the other age categories. (Table 4)

Table 4: Discard rates by donor characteristics Lusaka Province Blood Transfusion Centre - 2012

Donor Type		discard	useable	all	discard within donor category (discard/1,622) as percent	discard by donor population (discard/16,027) as percent	discard within donor characteristic (discard/**all**) as percent
First		1,067	8,614	9,681	65.8%	6.7%	11.0%
repeat		555	5,791	6,346	34.2%	3.5%	8.7%
	all	**1,622**	**14,405**	**16,027**	**100.0%**	**10.1%**	**10.1%**
Gender							
male		1,229	10,287	11,516	75.8%	7.7%	10.7%
female		393	4,118	4,511	24.2%	2.5%	8.7%
	all	**1,622**	**14,405**	**16,027**	**100.0%**	**10.1%**	**10.1%**
Age (yrs)							
16-24		1,058	11,414	12,472	65.2%	6.6%	8.5%
25-34		346	1,839	2,185	21.3%	2.2%	15.8%
35-44		200	1,036	1,236	12.3%	1.2%	16.2%
45-54		6	25	31	0.4%	0.0%	19.4%
55+		12	91	103	0.7%	0.1%	11.7%
	all	**1,622**	**14,405**	**16,027**	**100.0%**	**10.1%**	**10.1%**

Multivariate logistic regression:

When '**useable'** unit of blood was considered as outcome of interest (converse of discard), plausible determinants to explain reasons contributing to usability were explored using logistic regression to control for potential confounders.

The analysis showed that being female and a repeat blood donor and aged between 16 and 24 years were independently associated with a useable unit of blood. (Table 5)

Table 5: Multivariate logistic regression

Outcome: useable donor unit
Lusaka Province Blood Transfusion Centre - 2012

factor	unadjusted			adjusted		
	OR	95%CI	p value	**OR**	95%CI	p value
Repeat	**1.29**	1.16 to 1.44	P < 0.001	**1.37**	1.23 to 1.53	P < 0.001
female	**1.24**	1.1 to 1.39	P < 0.001	**1.25**	1.11 to 1.41	P < 0.001
16 -24	**2.03**	1.82 to 2.27	P < 0.001	**2.35**	1.95 to 2.84	P < 0.001
25-34	**0.54**	0.47 to 0.61	P < 0.001	**1.15**	0.94 to 1.42	P = 0.174
35-44	**0.55**	0.47 to 0.65	P < 0.001	**1.11**	0.89 to 1.38	P = 0.353
45-54	**0.47**	0.19 to 1.14	P = 0.096	**0.79**	0.37 to 1.67	P = 0.532
55 +	**0.85**	0.47 to 1.56	P = 0.606	**1.63**	0.96 to 2.75	P = 0.069

5.0 DISCUSSION

The results showed that of 16,027 units donated in 2012, 9,681 (60.4%) were from first time donors, 11,516 (71.9%) were from males, the majority (n=12,472, 77.8%) were aged between 16-24 years. The discard rate was 10.1% (n=1,622). Most were for a single disease marker positivity (n=1526, 94.1%). Disease marker positivity for HIV, Hepatitis B, Hepatitis C and Syphilis was: 2.9%, 6.0%, 0.6%, and 1.2% respectively. Using multivariate logistic regression, the safest donors (i.e. with a useable unit not discarded due to disease marker positivity) were females (OR 1.25, 95% CI 1.11-1.41), repeat donors (OR 1.37, 95% CI 1.23-1.53), and those in the age category 16-24 years (OR 2.35, 95% CI 1.95-2.84). This illustrated that repeat/regular, female, young, voluntary blood donors were the safest source of blood donors tested at the UTH/Lusaka Province Blood Transfusion Centre. Hepatitis B was the most common cause for discard.

The crude TTI discard rate of 10.1% recorded at the Lusaka Provincial Blood Centre in 2012 was high compared to similar centres in the neighboring country of Zimbabwe, which had a crude discard rate in 2012 of 5% (WHO, 2007). The implication of such high discard rate for the Lusaka Centre meant wastage of money as each time a unit of blood is discarded, US$40 goes to waste. However, in terms of blood safety, it means there was a significant prevention of passage of infections such as HIV, Hepatitis B hepatitis c and Syphilis through blood transfusion. This is the reason why a well- structured blood transfusion program is an effective preventive strategy for HIV and other TTI infections (WHO, 2007).

Largely, the TTI discards were due to a single infection leading to discard, which contributed 94.1 % and multiple infections for discard was only 5.9%. This has posed an operational challenge in that the there is no single question during the initial screening which would address all possible infections but rather the medical questionnaire needs to be designed more elaborately with questions tailored to address each specific infection amongst the TTIs.

In Lusaka, the trend of HIV seroprevalence amongst blood donors has been falling over the years and the prevalence of HIV recorded in the study at 3% was consistent with the

declining trend. The most plausible factors for this decline include increase in numbers of repeat blood donors, improvement in pre-donation screening techniques as well use of a laboratory-testing platform that has high sensitivity and specificity.

The declining trend is also consistent with the overall decline in HIV rates. According to the 2013-14 Zambia Demographic and Health surveys, 13 percent of adults aged 15-49 are infected with HIV (15 percent of women and 11 percent of men). A comparison of the HIV prevalence estimates from the 2001-02, 2007, and 2013-14 ZDHS surveys indicates that HIV prevalence among adults in Zambia has decreased over time (from 16 percent in 2001-02 to 13 percent in 2013-14) (CSO et al, 2014). This points to plausibility of gains attributable to multifactoral efforts being exerted in the communities by grass-root organizations (NGOs) and other government agencies involved in public health preventive strategies and disease awareness campaigns against HIV. In this study, the prevalence rate for HIV was found to be 3% amongst blood donors at the Lusaka Province Blood Transfusion Centre.

When within category analysis was done, the discard rates due to HIV were found to be less in repeat blood donors (1.8%) compared to first time donors (3.5%). This finding was consistent with similar studies done in other countries. For instance, Murphy et al (2010) published the findings of the study done in Europe between 1996 and 2004, which revealed that discard rates were higher in first time blood donors compared to repeat blood donors. Similarly, in a study done by Shrestha et al in Kathmandu Nepal, in 2009, HIV was found to be higher in first time donors compared to repeat donors.

However, in Brazil, a study did not reveal any significant difference between first time and repeat blood donors. In a study on HIV prevalence among blood donors in a blood bank in Curitiba (Brazil),results indicated that The prevalence of HIV among blood donors was 0.149% The frequency of HIV was statistically identical among first time blood donors and repeat donors (Andrade et al, 2002). By gender category, discard rates in male blood donors was 2.8% whereas in females it was higher at 3.1%. Different results were recorded in the Brazilian study (0.155% among men and 0.132% among women. (Andrade et al, 2002). By age category, the highest prevalence rate was found in category

25-34 years, which was 7.2% whereas the lowest was in the age category 16-24 years, which was 1.7%.

Hepatitis B remains the most common cause for discard and points to the need for adequate prevention strategies in that regard. There was no difference in terms of sero prevalences for Hepatitis B in first time and repeat blood donors. (6.0% and 6.2%). However, the prevalence was higher in male blood donors compared to female blood donors (6.7% and 4.3%) respectively. Comparison by age category showed that the Hepatitis B sero-prevalence was the lowest in the age category 45-54 years and the highest prevalence was in the age category 25-34 years. There are several postulated reasons for this. The number of donors in the age category 45-54 was only small (31/16,027) whereas in the category 25-34 years was much larger (2,185/16,027). As to whether the high numbers of blood donor in the 25-34 years age category had an effect on the outcome needs further exploration.

There is a small difference in discard rate due to hepatitis C justifying its testing (0.6% overall prevalence rate amongst blood donors). There was no difference in sero-prevalence rates in first time and repeat blood donors irrespective of gender and age categories (at 0.6%). Much as HCV was the lowest prevalent marker amongst the four TTI markers, the consequences of passage of HCV through blood transfusion is so serious that there is need to continue testing for it as one of mandatory tests for TTI markers.

The prevalence for syphilis was 1.8% in the first time donors and 0.4% in repeat blood donors. The prevalence was comparable in both male and female donors (1.2% and 1.3%). However, under stratified age categories, the highest prevalence was found in the category 45-54 years where it was 9.7% and the lowest was in the 16-24 years which was 0.4%

In general, findings from this study suggest that the selection criteria for blood donors may be better now than in the past and that repeat blood donors give a lower discard rate than first time donors. Female blood donors and in the age category of 16-24 years are safer source of blood at Lusaka Blood Transfusion Centre.

Study Limitations

This study focused on donor characteristics of units of blood only. Some individuals may have donated more than once in a 12-month period. There was no follow up on each individual donor. This could have led to a slight over-estimate. Other demographic and geographical characteristics, apart from those mentioned in the results were not used in this study, as they are not routinely collected. This could be a pointer for future research.

6.0 CONCLUSION

The study revealed that there was a difference in donor characteristics regarding Transfusion Transmissible Infections (TTIs). TTIs were higher in first time voluntary blood donors than in repeat voluntary blood donors. In other words, repeat blood donors had a lower discard rate than first time donors. Further, repeat female blood donors in the age category of 16-24 years were the safest source of blood at Lusaka Blood Transfusion Center in 2012. In terms of specific infections, Hepatitis B was the most prevalent across all donor demographics.

7.0 RECOMMENDATIONS

1. There is need for the Ministry of Health Zambia to consider safer donor retention strategies as driver for the blood program in Zambia. For example, the donor questionnaire is made more specific to address risk factors for HIV and Hepatitis B.

2. Nurse phlebotomists are trained to be more vigilant when examining donors in categories found with a higher percentage of seropositivity. Further, possibility of donor referral system should be introduced in which case all positive cases should be referred to specialized units dealing with long-term support to individuals who are HIV and Hepatitis B positive.

3. There is need for the ZNBTS to create linkages with other organizations involved in community health programs that can help in health information dissemination on a sustainable basis.

4. Ministry of Health and the Zambia National Blood Transfusion Service should strengthen donor retention strategies in which all seronegative donors are counseled on the need to remain negative for TTIs (particularly HIV).

5. There is need to consolidate the existing hepatitis B vaccination. In addition to immunization in childhood, there is need to provide immunization to adults who are negative for hepatitis B.

6. Need for donor loyalty strategies such as formation of blood donor clubs for repeat donors in communities. This would form the basis for a sustainable safer and predictable blood programme.

7. Need for specific information packages for donors in line with market segmentation approach

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Appendix 1

For each unit of donated blood, information on donor age, gender, whether first of repeat donor and test result of disease marker was entered in an Excel spreadsheet. The proforma is shown below.

Unit #	Donor age	Gender (male or female	First or repeat donor	HIV	ABO group	Rh factor	Hepatitis B (HBV)	Hepatitis C (HCV)	Syphylis
1									
2									
3									
.									
.									
.									
.									
.									
16,027									