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RESEARCH ARTICLE

VOLUNTARY BLOOD DONOR RETENTION IN JOS, NEW TRANSFUSION TRANSMISSIBLE
INFECTIONS: THE IMPLICATIONS FOR A RESOURCE DEPENDENT SETTING

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ABSTRACT

Introduction: Blood donors are generally scarce and few in most developing countries, Nigeria inclusive. The retention of available safe blood donors, a pool of reliable committed blood givers, may reduce protracted acute blood shortage.

Aims: This study sought to determine the donor retention rate, new TTIs rate and make recommendations that suit our setting.

Methods: This retrospective study was carried out at the North Central Zonal Centre of the National Blood Transfusion Service (NBTS), Jos. All blood donors who donated at the NBTS centre between January 2009 and December 2013 were analyzed and categorized into first time and retained donors. Retained donors were further grouped according to their number of donations and rate of TTIs.

Results: Thirty thousand two hundred and sixty four people, mean age 24.6 years; 70.5% males and 29.5% females donated blood within the study period. The crude TTIs rate of all blood donors 18.5% and 9.1% among committed donors. Repeat blood donors were 11,198 (37.0%), consisting of 90.5% regular and 9.5% lapsed. 97.8%, and 2.2% retained donors donated 2-15 and above 15 times with the crude TTIs rates of 9.1%, and 0.0% respectively.

Conclusion: Blood donor retention could be successful in a resource poor setting with the advantage of decreasing TTIs rate associated with increasing number of donations. We further conclude that the retention of donors could enhance efficient utilization of donor funds.

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INTRODUCTION

Blood donors are generally few in most developing countries, Nigeria inclusive. An evaluation of the return rate of registered volunteer blood donors at the Redeirao Preto Blood Centre reported a 40% individual return within one year after the first donation and 53% within two years with higher return rate among their black donors (Adriana *et al.*, 2011). Studying blood donors in Hong Kong, Yu *et al.* (2007) reported three donation patterns; one-time, drop-out and committed blood donor behaviours and recommended the identification of first-time donors with potential to become committed and committed donors with the potential for more frequent donations as steps towards the development of targeted donor retention.² Schreiber et al in an earlier work, reported that long term donor return correlated progressively with increasing donation frequency in the first year (Schreiber *et al.*, 2005). Thomson *et al.* in 1998 reported that only 3.4% of safe donors

in an American blood centre expressed low likelihood of donating again within the next 12 months (Thomson *et al.*, 1998). A higher proportion of their donors unlikely to return were first-time, minority group and the uneducated. Safe donor loss was also likely among those who felt poorly treated by blood centre staff and poor physical wellbeing during and after blood donation (Thomson *et al.*, 1998). France and colleagues in a 2004 donor reaction inventory study, reported that donors with mild donation reactions were less than half likely to return to donate in the following year (France *et al.*, 2004). Yu and others reported institutional incentives for altruism such as post donation information services and the inherent mechanism of communication impacted to draw the public to donate blood in Mainland China (Yu *et al.*, 2013). Misje and co-workers while analyzing motivational and socio-demographic factors for the development of long-term commitment to voluntary non-remunerated blood donation, reported the influence of an active donation as the most important (Misje *et al.*, 2005). They further identified five dimensions of blood donor motivation; altruism, self esteem, moral obligation, positive experiences

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associated with donation and social reasons (Misje *et al.*, 2005). Bani and Strapparava, while studying motivation and commitment in Italian blood donors, documented that check on one's health status accounted for 6.9 percent donation motivation (Bani and Strapparava, 2011). Other factors identified were personal choice in 41.3%, voluntary blood donation in 21.8%. They further observed the positive relationship between commitment to donor organization and number of total and annual donations and the number of new donors recruited (Bani and Strapparava, 2011). A report from study in an Iranian blood service show that 51.7% of first-time donors returned to donate again during the three years after first donation, the return rate directly correlating with the number of donations in the first year (Kasraian and Tavassoli, 2012). The donor return rate in their study was higher for male and single donors but not related to age or educational level (Kasraian and Tavassoli, 2012). The generation of a sufficient population of voluntary blood donors who are not at risk of contracting and transmitting transfusion transmissible infections is a difficult task in Nigeria as most people are not favourably disposed to blood donation due to the combined barrier of culture, tradition and ignorance. The desire to increasingly meet the demand for blood transfusion requires the retention of safe blood donors for subsequent donation which may suit dire situations requiring fresh whole blood and or platelet concentrate transfusion.

Aims

This study sought to determine the donor retention rate, transfusion transmissible infections among retained donors and the strategies applied for retention. It also aimed to make recommendations for improved voluntary blood donor retention.

METHODS

This retrospective study was carried out at the North Central Zonal Centre of the National Blood Transfusion Service, Jos. All blood donors who donated at the NBTS centre or in hospital's blood banks and samples received at the blood service centre were analyzed and categorized into first time and retained donors. Retained donors (those who donated at least twice every twelve months) were further grouped according to their number of donations and rate of TTIs.

The strategies applied for the retention of donors were also reviewed. Transfusion Transmissible Infections were screened for by the ELISA methods. Genscreen ULTRA HIV Ag-Ab and Monolisa HBs Ag ULTRA (BioRad Mames-La Coquette-France) kits were used to screen for HIV and hepatitis infection markers. HCV Ab version 4.0 and Sphillis Ab version ULTRA (DIA.PRO Diagnostic Bioprobes, Sesto San Giovanni- Italy) were respectively used to screen for hepatitis c and syphilis antibodies. Epi info statistical software was used for data analysis. Ethical approval was obtained for this study from the ethical committee of the NBTS, North Central Zonal Centre, Jos.

RESULTS

Thirty thousand two hundred and sixty four people donated blood to the North Central Zonal Centre of the NBTS between January 2009 and December 2013. The blood donor's age ranged from 18 to 65 (mean 24.6) years. 21,330 (70.5%) were male while 29.5% were female donors. The crude TTIs rate of all blood donors in our study was 18.5% while the infection rate among committed donors was 9.1%. Repeat blood donors were 11,198 (37.0%), consisting of 10,130 (90.5%) regular and 1068 (9.5%) lapsed. About 84%, 11.4%, 2.6%, 1.5% and 0.7% retained donors donated 2-5, 6-10, 11-15, 16-20 and above 20 times with a declining crude TTIs rates of 10.2%, 4.3%, 1.0%, 0.0% and 0.0% respectively (Table 1). Hepatitis B virus accounted for 71.9% TTIs with 68.2% detected among 2-5 times donors, 3.4% among those who donated 6-10 times and 1.0% in 11-15 times donors. HCV accounted for 24.9% with 23.5% and 1.4% among 2-5 and 6-10 times donors respectively. Only 0.6% TTIs among repeat donors was due to syphilis infection, limited to 2-5 times repeat while 1.7% TTIs was HIV infection (1.4% and 0.3% respectively among 2-5 and 6-10 times donors). Co-infection with HIV and HBV was responsible for 0.9% crude TTIs among retained donors. 0.6% co-infections were among 2-5 and 0.3% among 6-10 times committed blood givers Table 2.

DISCUSSION

Constant advocacy and awareness creation were embarked upon by personnel of the blood service in order to change the attitude of the society towards altruistic, against the more popular but low quality replacement and paid, blood donation in service to humanity.

Table 1. Distribution of retained blood donors and TTIs

Number of donations	Number of repeat donors (%)	Number TTIs Positive (%)	HBV (%)	HCV (%)	HIV (%)	Syphilis (%)	HBV/HIV (%)
2-5	3217 (83.8)	329 (10.2)	238 (7.4)	82 (2.5)	5 (0.2)	2 (0.06)	2 (0.06)
6-10	438 (11.4)	19 (4.3)	12 (2.7)	5 (1.1)	1 (0.2)	0 (0.0)	1 (0.2)
11-15	100 (2.6)	1 (1.0)	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
16-20	56 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
>20	28 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	3839 (100.0)	349 (9.1)	251 (71.9)	87 (24.9)	6 (1.7)	2 (0.6)	2 (0.6)

Legend: TTI = Transfusion Transmissible Infection, HBV = Hepatitis B Virus, HCV = Hepatitis C Virus, HIV = Human Immunodeficiency Virus

Table 2. Distribution of TTIs among retained donors

TTIs	Number of donations			Total (%)
	2-5 (%)	6-10 (%)	11-15 (%)	
HBV	238 (68.2)	12 (3.4)	1 (0.3)	251 (71.9)
HCV	82 (23.5)	5 (1.4)	0 (0.0)	87 (24.9)
HIV	5 (1.4)	1 (0.3)	0 (0.0)	6 (1.7)
Syphilis	2 (0.6)	0 (0.0)	0 (0.0)	2 (0.6)
HBV/HIV	2 (0.6)	1 (0.3)	0 (0.0)	3 (0.9)
Total	329 (94.3)	19 (5.4)	1 (0.3)	349 (100)

Legend: TTI = Transfusion Transmissible Infection, HBV = Hepatitis B Virus, HCV = Hepatitis C Virus, HIV = Human Immunodeficiency Virus

These have resulted in changes in the characteristics of blood donors including commitment to blood donation. The age range of our blood donor (18-65 years) is within the limits for blood donation in Nigeria to meet the age of consent and avoid blood collection from donors with asymptomatic age related organ function insufficiency and haematologic diseases. The mean age of 24.6 years in our study is however at variance with that of Ymele *et al.* (2012) who documented a mean age of 28 years for blood donors in Cameroon (Ymele *et al.*, 2012). The mean age of our donors in this work is also lower than 32.4 years we earlier documented (Damulak *et al.*, 2013). These differences may be due to increasing number of voluntary blood donors and younger adults cultivating informed attitudes to blood donation. Male (70.5%) donors in our study is more than the female (29.5%) group, which has not change significantly from 36.2% and 29.79% female donors earlier recorded in the centre (Damulak *et al.*, 2012; Damulak *et al.*, 2013). The rate of female enrollment into blood donation observed in this study is higher than 11.0% documented by Terry and co-workers in a hospital blood bank in Osogbo South West Nigeria (Terry Alli *et al.*, 2011). The female blood donors in our study is higher than 7.8% documented by Nkrumah *et al.* (2011) among Ghanaian blood givers (Nkrumah *et al.*, 2011). This difference may be the result of increasing awareness on blood donation created by the blood service, peer group influence and improved donor management. The lower rate of female donation compared to the male may be due to cultural perception on blood and donation, regular menstrual flow, pregnancy and lactation and difficulty in obtaining the male partner's approval. There is need to increase awareness in the communities and among the female group to dispel wrong cultural perceptions and myths that discourage female blood donation.

Thirty seven percent (37.0%) donor repeat donations documented in this study is an improvement over 22.0% and 23.5% donor retention we earlier documented, suggesting an increasing acceptance and commitment to blood donation in our region (Damulak *et al.*, 2013; Dapus *et al.*, 2012). This calls for further strengthening of blood donor retention by designing new strategies and sustenance of existing ones. Formation and support of committed blood donor groups by the blood service could enhance blood donation awareness, first-time blood donor recruits and retention.

The 9.1% crude TTIs rate observed in our study among repeat donors (Table 1) is lower than the combined TTIs rate of 18.7% documented among combined voluntary and replacement donors donating at a health care centre in Tete, Mozambique, but similar to 9.5% reported among blood donors in Ethiopia, East Africa (Stokx *et al.*, 2006; Tessema *et al.*, 2010). There is need to source for blood donors with low risk for contracting and transmitting TTIs and the retention of safe ones for repeat donations to reduce the overall infection rate among our blood givers and the risk of transfusion acquired diseases. The creation of voluntary blood donor retention desk in the donor clinics of the blood service along with practicable and sustainable strategy for donor commitment and personnel motivations may increase blood collection from this safer group to the greatest source of safe blood rather than the voluntary first-timers. Observations from our work show that 97.8% of committed donors donated between two and fifteen times. 83.8% and 2.6% donated 2-5 and 11-15 times respectively while 1.5% and 0.7% donated 16-20 and above 20 times respectively (Table 1). There are no sufficient data we know of that described retention of donors to this extent. The documentation of exact contacts of first time donors and regular follow up by personnel could create friendly familiarity, trust and confidence in the blood service. Education of students on blood donation at the secondary and tertiary levels of education could lead to their early enrollment into blood donation and long term commitment which would raise a reliable blood donor group of lowest risk regularly counseled on safe life style.

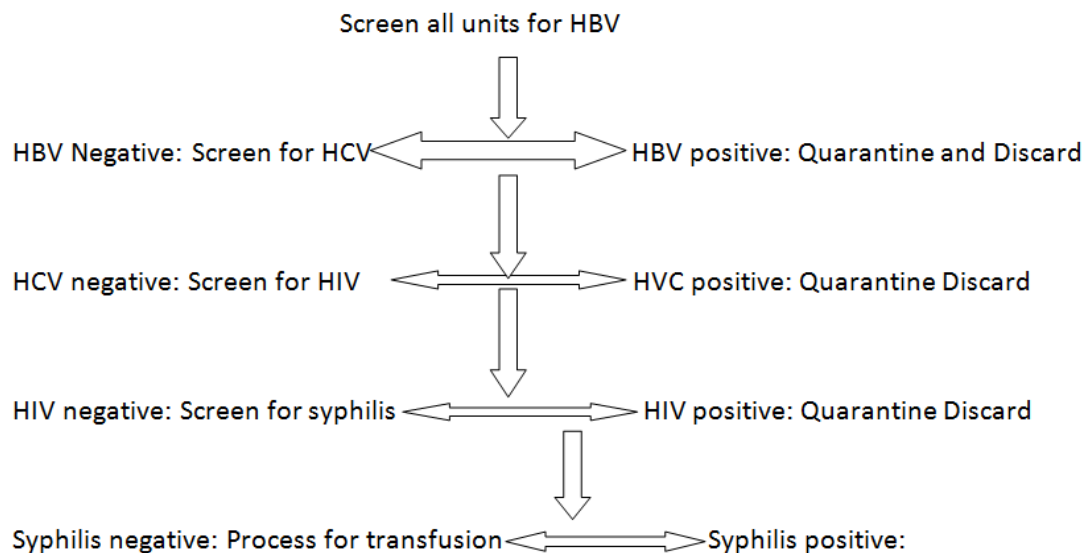
The crude TTIs rate of our committed blood donors was highest (10.2%) among donors with lower number of donations (2-5 times) and declined to 4.3% and 1.0% respectively among 6-10 and 11-15 times donors. The prevalence of HBV and HCV among our committed donors who donated less than 11 times is higher than 0.787% HBV and 0.267% HCV documented by Petrovic and others among their predominantly male blood donors in Northeast Bosnia and Herzegovina (Petrovic *et al.*, 2011). The prevalence of HBV and HCV among 2-5 and 6-10 times donors in our study are similar to 4.61% HBV and 2.90% HCV documented among blood donors of Phitsanulok regional blood centre, Thailand, Southeast Asia (Luksamijarulkul *et al.*, 2002). The rate of 0.4% HIV seropositivity among our committed donors is similar to the

prevalence of 0.69% documented in their study and 0.247% reported by Makroo and colleagues among repeat donors donating in a tertiary health care centre of Northern India (Luksamijarulkul *et al.*, 2002; Makroo *et al.*, 2011). The higher rate of HBV and HCV among our repeat donors compared to donors of the Asian region suggest regional variation in the prevalence of these infections agents, susceptibility and lifestyle. We suggest the conservation of safe committed donor pool by vaccination with potent HBV vaccine and the development of same against HCV and HIV. There were no TTIs detected among 2.2% donors who donated 16 times and above (Table 1) confirming the superior safety of blood collected from long term over first-time and short term committed voluntary donors. The detection of markers of TTIs in our committed donors of up to 15 times, suggests the need to intensify the application of donor selection criteria and safe lifestyle counseling at each donation visits. This step would identify and defer donors initially safe but subsequently at risk of contracting and transmitting TTIs and also encourage still safe ones to maintain low risk lifestyle while screening all blood units donated for TTIs appropriately before transfusion. The absence of detectable markers of HBV, HCV, HIV and syphilis among our donors of above 15 times donation provide a group from which blood can be collected and use in dire situation, such as transfusion demands in crisis situations in conflict prone setting like ours with limited number of blood donors. The retention of safe donors and follow up for regular repeat blood donation offers the opportunity to detect, study and better understand disease progression in acute HIV and other viral infections in safe donors who become reactive.

transplantations. CMV negative units should be selected for transfusion of patients whose disease may require myeloablation, stem cell transplant and immunosuppressive agents. Transfusion transmissible agents detected among retained blood donors in our study included all the mandatory TTIs that should be sneegative in any blood unit before transfusion. Hepatitis B virus was responsible for majority (71.9%) of reactions, hepatitis C virus 24.9%, while HIV and Syphilis constituted 1.7% and 0.6% respectively (Table 2). HBV/HIV co-infections accounted for 0.9% TTIs positive reactions among repeat donors, who have donated 2-10 times (Table 2), pointing to the risk of infecting recipients of such units with dual agents if poorly tested. Co-infection of hepatitis B virus with HIV has been associated with higher progression to acquired immunodeficiency syndrome (AIDS) (Eskild *et al.*, 1992).

The screening of all blood units collected from committed donors should be staggered. Screening for HBsAg would discard 72.8% TTIs positive units followed by testing for HCV which would further identify another 24.9% leaving only 2.3% (Table 1) TTIs to be detected at HIV and syphilis screenings. The inability of treponema palidium to survive at blood storage temperature (2-6 °C) and available antibiotics for the treatment of syphilis infection suggests that positive units could be used after 72 hours storage at 2-6 °C in dire situations, frequently witnessed in our setting, otherwise quarantine till expiration. Resources which would have been expended in screening the four TTIs testing on all units may be reduced and rechanneled to providing other services.

Proposed screening protocol for blood units from committed blood donors



There is need to also screen donors of this frequency for other infectious agents like cytomegalovirus (CMV) which has been reported higher among frequent donors than first time blood donors (Terry *et al.*, 2011). This would prevent haematogenous transmission, infection and disease reactivation during immunosuppression induced by disease or treatment in the face of increasing standard of health care delivery including

The staggered testing would also reduce personnel workload, cross contamination and retesting, and equipments wear and tear without compromising quality. The testing of all blood units for transfusion is mandatory to avoid inadvertent transmission of disease from a multiple time donor to single or multiple recipients of components as reported by Laffon and colleagues in Missouri and Colorado (Laffoon *et al.*, 2008).

Conclusion

Blood donor retention could be successful in a resource poor setting like ours with decreasing TTIs rate matched by increasing donation frequency. We further conclude that the retention of donors could enhance efficient utilization of donor funds in donor resource dependent settings through staggered screening of blood.

Recommendations

The blood service should design a practicable strategy for safe voluntary blood donor retention through sustainable donor appreciation and personnel motivation. We also recommend the development of testing strategy that takes advantage of the frequency of the TTIs among committed blood givers in our setting to improved efficient utilization of resources.

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