

The Frequency of Transfusion-transmissible Infections Among Donors in 2023 at the National Blood Transfusion Service in Guyana

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Abstract

Objective: To determine the frequency of transfusion-transmitted infections and their demographic characteristics among donors in Guyana.

Design and Methods: A cross-sectional study was conducted from January to October 2023, involving 9,037 voluntary blood donors aged 16 to 65 years across Guyana. All participants met eligibility criteria, provided informed consent, and the study received ethical approval. Data was analysed using STATA 18.0, with statistical significance set at p -value < 0.05 .

Results: The overall frequency of transfusion-transmissible infections (TTIs) among donors was 3.34%. The frequencies of TTIs were as follows: Syphilis (1.58%), Hepatitis B Virus (HBV, 0.92%), Human T-Lymphotropic Virus (HTLV, 0.43%), Hepatitis C Virus (HCV, 0.20%), Human Immunodeficiency Virus (HIV, 0.20%), and Chagas disease (0.18%). TTIs varied notably by age group. Syphilis was most prevalent among donors aged 45–65, HBV among those 45–54, HTLV in the 35–44 and 55–65 age ranges, and Chagas was highest in the 55–65 group.

The average donor age was 36.42 years. Females comprised 36.05% of the donor population and showed higher rates of HTLV compared to males. First-time donors exhibited significantly higher positivity rates for Syphilis, HBV, HTLV, and Chagas disease, underscoring the need for stronger screening efforts and targeted awareness campaigns.

Conclusion: This study highlights the frequency of TTIs among blood donors in Guyana, emphasizing the significant risks posed by Syphilis, HBV, and HTLV. Higher frequencies were observed in Syphilis and HTLV, among first-time donors; this underscores the need for enhanced screening and sensitization on prevention measures.

Keywords: Transfusion-transmissible Infections (TTIs), First-time Donors, Repeat Donors, Frequency, Positivity, Screening

Introduction

The National Blood Transfusion Service (NBTS) in Guyana is the only provider of blood and blood components nationwide, ensuring a safe and adequate blood supply for all public and private hospitals by encouraging voluntary blood donations and implementing robust screening methods.

In recent years, there have been concerns about the frequency of transfusion-transmissible infections (TTIs), including Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), Hepatitis C (HCV), Human T-lymphotropic Virus (HTLV), and Syphilis among blood donors in Guyana. These infections pose a significant threat to the safety of the national blood supply and high-

light the need for a comprehensive understanding of their epidemiology patterns within the donor population. Furthermore, the World Health Organization (WHO) recommends continuous surveillance and data analysis to identify trends and inform public health interventions [1].

High positivity rates can lead to the discarding of valuable blood units, thereby affecting the overall blood supply and resources needed. Understanding these rates will not only enhance donor screening protocols but also ensure the safety of the blood supply and improve the efficiency of the transfusion service. This study aims to determine the frequency of transfusion-transmissible infections and their demographic characteristics among donors in Guyana.

Methodology

This cross-sectional study was conducted at the National Blood Transfusion Service in Guyana to determine the frequency of TTIs in blood donors in 2023 (January 1 to October 30, 2023). A total of 9,037 donors were included in this study across multiple administrative regions in Guyana (Region 1-10), Georgetown Mobile drives (GM), and at the centralised location (GT). Voluntary blood donors were considered eligible for this study if they were between the ages of 16 and 65 years, weighed at least 110 pounds (50kg), and met specific health criteria, including

haemoglobin levels of 12.5g/dl or higher, a pulse rate of 50-100 beats per minute, and a normal blood pressure.

Data for each donor was collected using a donor criterion form and the NBTS's Data Management Software (Delphyn). This was then entered into a pre-designed Microsoft Excel spreadsheet. The data was analysed with STATA version 18.0, and a p-value < 0.05 was considered significant.

Informed consent was obtained from each donor, and confidentiality was maintained during the process of this study with the use of barcodes throughout the blood donation and screening procedures. Ethical permission for this study was obtained from the Institutional Review Board (IRB) and the Director of NBTS.

Results

During the study period (January 1 and October 30, 2023), all 9,037 blood donations received met the inclusion criteria at all the NBTS collection sites. Our analysis revealed varying frequencies of TTIs: 1.58% of donors for Syphilis, 0.92% for Hepatitis B Virus (HBV), 0.43% for Human T-Lymphotropic Virus (HTLV), 0.20% for Hepatitis C Virus (HCV) and 0.20% for Human Immunodeficiency Virus (HIV), and 0.18% for Chagas disease as shown in Table 1. The age distribution of donors ranged from 16 to 65 years, with an average age of 36.42 ± 0.12 years.

Table 1: Frequency of transfusion-transmissible infections (TTIs) and demographic characteristics of blood donors in Guyana, 2023.

	Number of samples tested			% (95% Conf. Inter-val)
	Positive	Negative	Total	
Syphilis	143	8,894	9,037	1.58% (1.33% - 1.84%)
HBV	83	8,954	9,037	0.92% (0.72% - 1.12%)
HCV	18	9,019	9,037	0.20% (0.11% - 0.29%)
HIV	18	9,019	9,037	0.20% (0.11% - 0.29%)
HTLV	39	8,998	9,037	0.43% (0.30% - 0.57%)
Chagas	16	9,021	9,037	0.18% (0.09% - 0.29%)
At least one TTI	302	8,735	9,037	3.34% (2.97% - 3.71%)

Age, years (mean \pm SD, min-max) 36.42 ± 0.12 years, 16.00-65.00 years

The frequency of TTIs varied by age-groups, with significantly higher occurrences of Syphilis in the 45-54 years and 55-65 years age-groups [47 (3.13%) and 30 (4.05%) respectively]. For HBV, the frequency was significantly higher for the 45-54 group [21(1.40%)]. For HTLV, the frequency was significantly higher for the 35-44 years and 55-65 years [14 (0.62%) and 6 (0.81%), respectively, and for Chagas disease in 55-65 years, 5 (0.67%), as shown in Table 5.

Female donors represented 36.05%, while male donors were 63.95%. There was no significant difference by gender in the proportion of positivity for Syphilis, HBV, HCV, HIV, and Chagas. However, for HTLV, females had a significantly higher frequency than males (RR, 3.99; 95% CI, 2.02-7.88; p-value < 0.0001).

Table 2: Frequency of TTIs, by Gender

	% Positive samples		RR (95% CI, p-value) Observation	Observation
	Females [n= 3,258 (36.05%)]	Males [n= 5,779 (63.95%)]		
Syphilis	54 (1.66%)	89 (1.54%)	1.08 (0.77 - 1.51, p = 0.668)	Not Sig.
HBV	29 (0.89%)	54 (0.93%)	0.95 (0.61 - 1.49, p = 0.832)	Not Sig.

HCV	10 (0.31%)	8 (0.14%)	2.22 (0.88 - 5.61, p = 0.085)	Not Sig.
HIV	5 (0.15%)	13 (0.22%)	0.68 (0.24 - 1.91, p = 0.464)	Not Sig.
HTLV	27 (0.83%)	12 (0.21%)	3.99 (2.02 - 7.88, p < 0.0001)	Sig.
Chagas	4 (0.12%)	12 (0.21%)	0.59 (0.19 - 1.83, p = 0.357)	Not Sig.

From our donor pool, first-time donors represented 31.81%, while repeat donors represented 68.19%. There was no significant difference in donor status for HIV and HCV. However, the proportion of positivity in first-time donors was significant-

ly higher for Syphilis (RR, 1.55; 95% CI, 1.11-2.15; p-value = 0.009), HBV (RR, 2.20; 95% CI, 1.43-3.37; p-value = 0.0002), HTLV (RR, 2.26; 95% CI, 1.21-4.22; p-value = 0.009), and Chagas (RR, 3.57; 95% CI, 1.30-9.82; p-value = 0.008).

Table 3: Frequency of TTIs amongst blood donors, by Donor status

	% Positive samples		RR (95% CI, p-value)	Observation
	First-time donors [n= 2,875 (31.81%)]	Repeat donors [n= 6,162 (68.19%)]		
Syphilis	60 (2.09%)	83 (1.35%)	1.55 (1.11 - 2.15, p = 0.009)	Sig.
HBV	42 (1.46%)	41 (0.67%)	2.20 (1.43 - 3.37, p = 0.0002)	Sig.
HCV	9 (0.31%)	9 (0.15%)	2.14 (0.85 - 5.39, p = 0.097)	Not Sig.
HIV	8 (0.28%)	10 (0.16%)	1.71 (0.68 - 4.34, p = 0.4249)	Not Sig.
HTLV	20 (0.70%)	19 (0.31%)	2.26 (1.21 - 4.22, p = 0.009)	Sig.
Chagas	10 (0.35%)	6 (0.10%)	3.57 (1.30 - 9.82, p = 0.008)	Sig.

There was no significant difference when geographic variation was compared to TTIs in Guyana for Syphilis, HBV, HCV, and HIV. However, the proportion of positivity was significantly

higher for HTLV for donors from GM and Chagas for donors from Region 09.

Table 4: Frequency of TTIs amongst blood donors, by Donation sites

	GT [n=2888 (31.96%)]	GM [n=2719 (30.09%)]	R02 [n=413 (4.57%)]	R03 [n=413 (8.52%)]	R06 [n=413 (17.65%)]	R09 [n=413 (4.84%)]	R10 [n=413 (2.38%)]	Observation
Syphi- lis	47 (1.63%)	31 (1.14%)	8 (1.94%)	22 (2.86%)	19 (1.19%)	9 (2.06%)	7 (3.26%)	Not Sig.
HBV	30 (1.04%)	19 (0.70%)	4 (0.97%)	10 (1.30%)	18 (1.13%)	2 (0.46%)	0	Not Sig.
HCV	2 (0.07%)	3 (0.11%)	7 (1.69%)	2 (0.26%)	3 (0.19%)	1 (0.23%)	0	Not Sig.
HIV	7 (0.24%)	9 (0.33%)	0	2 (0.26%)	0	0	0	Not Sig.
HTLV	6 (0.21%)	20 (0.74%)	0	5 (0.65%)	6 (0.38%)	2 (0.46%)	0	Significantly higher (p<0.05) for GM
Chagas	4 (0.14%)	4 (0.15%)	1 (0.24%)	0	3 (0.19%)	4 (0.92%)	0	Significantly higher (p<0.05) for R09

Table 5: Frequency of TTIs amongst blood donors, by age group

	15-24 years (n=1,787)	25-34 years (n=2,760)	35-44 years (n=2,246)	45-54 years (n=1,503)	55-65 years (n=741)	Observation
Syphi-lis	16 (0.90%)	32 (1.16%)	18 (0.80%)	47 (3.13%)	30 (4.05%)	Significantly higher ($p<0.05$) for 45-54 years and 55-65 years
HBV	9 (0.50%)	24 (0.87%)	24 (1.07%)	21 (1.40%)	5 (0.67%)	Significantly higher ($p<0.05$) for 45-54 years
HCV	0	1 (0.04%)	5 (0.22%)	8 (0.53%)	4 (0.54%)	Not Sig.
HIV	5 (0.28%)	7 (0.25%)	3 (0.13%)	2 (0.13%)	1 (0.13%)	Not Sig.
HTLV	3 (0.17%)	10 (0.36%)	14 (0.62%)	6 (0.40%)	6 (0.81%)	Significantly higher ($p<0.05$) for 35-44 years and 55-65 years
Chagas	2 (0.11%)	3 (0.11%)	4 (0.18%)	2 (0.13%)	5 (0.67%)	Significantly higher ($p<0.05$) for 55-65 years

Discussion

Blood products remain one of the most significant vectors for transfusion-transmissible infections (TTIs), especially in regions where resources are limited and the prevalence of infectious diseases is high. TTIs remain a threat, even in areas where resources are not as scarce. According to Niazkar et al. (2020), there is approximately a 1% risk of TTI transmission per unit of blood transfused, a concerning statistic given the vulnerability of recipients. Despite significant advances in donor screening and laboratory testing, the risk of TTIs remains because of the window period of the infections.

The objective of this study was to evaluate the frequency of TTIs, including HBV, HCV, HIV, HTLV, Syphilis, and Chagas disease. The sample size (9,037) represented an appropriate portion of the donor population in Guyana (~10,000 units per annum). The overall frequency of TTIs among blood donors in Guyana was 3.34 %. This rate is relatively lower compared to findings from other studies, which reported frequencies ranging from 4.04% to 10.7% [2-4]. The frequency of Syphilis (1.58%) observed in this study, however, exceeded those reported in similar research. Pessoni et al. (2019) found a frequency of 0.87% among blood donors in Brazil, while Chen et al. (2022) reported a rate of .33%. This highlights a notable risk within the donor population, indicating the need for enhanced screening measures and interventions to curb the transmission of this infection.

HBV was detected at a frequency of 0.92%, which is lower than rates reported in comparable studies, such as 1.08% and 1.8%, emphasizing the importance of sustained public health efforts. Nevertheless, HCV and HIV showed a frequency of 0.20%, consistent with findings from other studies [5, 6]. HTLV frequency (0.43%) was significantly higher among blood donors in Guyana compared to rates documented in Brazil, which ranged from 0.09% to 0.23% [4, 7].

The frequency of Chagas disease was 0.18%, although a sparsity of comparable studies limits a broader contextual analysis of its frequency among blood donors.

The results demonstrated a predominance of male donors (64%) compared to female donors (36%), consistent with prior studies that have reported male dominance in blood donor populations. Crocco and D'Elia (2007) found that 75.74% of donors were male, yielding a notable 3:1 male-to-female ratio. Similarly, Orru et al. (2021) observed a 57% male participation rate in their study. Particularly, while most TTIs showed no significant gender differences, HTLV exhibited a significantly higher frequency among female donors (0.83%) compared to males (0.21%), with females being four times more likely to test positive (RR = 3.99; 95% CI: 2.02–7.87; p -value < 0.0001) [8-10].

We observed that 31.8% of donors were first-time contributors, while 68.2% were repeat donors. First-time donors were significantly more likely to test positive (compared to repeat donors) for Syphilis (RR = 1.55; 95% CI: 1.11–2.15; p -value = 0.009), HBV (RR = 2.20; 95% CI: 1.43–3.36; p -value = 0.0002), HTLV (RR = 2.26; 95% CI: 1.21–4.22; p -value = 0.0089), and Chagas disease (RR = 3.57; 95% CI: 1.30–9.82; p -value = 0.0083). These findings are consistent with the results of Zezai et al. (2020), who reported that first-time donors (4.74%) exhibited a higher frequency of TTIs compared to repeat donors (0.15%). This occurrence may be due to the lack of prior screening and limited exposure to donor education and preventative counseling. These also further highlight the positive contribution of sensitisation messages during donation sessions and emphasize that regular, repeat donors are a safer and more reliable source of blood [11, 12].

The data revealed a significant association between some age groups and TTIs. For Syphilis, age groups 45-54 and 55-65 were significantly higher. For HBV, significant results were seen in the 45-54 age group. HTLV showed significance in the 35-44 age group, and Chagas showed significance in the 55-65 age group. No significance in age groups was observed between HCV and HIV. The age-groups observed in this study align with the findings revealed by Siraj et al (2018) and Chen et al (2022), who reported a higher positivity in donors above age 45 years.

These findings demonstrated the critical need for robust screening systems and tailored interventions to mitigate the transmission of TTIs and ensure the safety of blood transfusions [13].

Conclusion

This study highlights the frequency of transfusion-transmissible infections within the blood donor population of Guyana. The overall frequency of 3.34% was commonly seen in infections such as Syphilis, HBV, and HTLV. There was a significantly higher frequency of HTLV and Syphilis among first-time donors when compared to repeated donors, indicating that first-time donors tend to carry a higher risk of TTIs.

There was a significant correlation between gender and HTLV infections, indicating that female donors were more likely to test positive for HTLV compared to their male counterparts, suggesting the potential biological, behavioral, or socio-cultural factors that may be an influence on the transmission or susceptibility of HTLV in females. However, before a definitive conclusion can be made on this, additional research is necessary to analyze these potential contributing factors in greater depth.

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