



Sero-prevalence of HIV, HBV and HCV among Blood Donors in the Kintampo Municipal Hospital, Ghana

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Authors' contributions

Authors WW, PH and SA extracted the data. Authors WW, EKV and JBZ analyzed the data. Authors SEKA and EMD assisted in write-up of the manuscript. All the authors made significant contributions to the development of the manuscript.

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ABSTRACT

Aims: This study aimed at establishing the prevalence of some viral Transfusion Transmissible Infectious (TTI) agents among blood donors in the Kintampo North municipality of Ghana.

Study Design: A retrospective cross-sectional hospital based study.

Place and Duration of Study: The study was conducted at the Laboratory unit of the Kintampo Municipal Hospital between May and August, 2013.

Methodology: Archived results (from January 2010 to December 2012) on blood donation from the hospital's laboratory were reviewed manually. Data comprising age, sex and results on HBsAg, anti-HCV and anti-HIV tests of blood donors were reviewed. The data were analyzed using Microsoft excel 2007 statistical package.

Results: A total of 3402 people were screened for blood donation. Out of this number 3139 (92.3%) were males while 263 (7.7%) were females. The combined sero-prevalence

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of HBsAg, anti-HCV and anti-HIV was 19.5% (643/3139) and 11.4% (30/263) for males and females respectively. Hepatitis B surface antigen year-on-year prevalence was 9.6%. Anti-HCV and anti-HIV recorded year-on-year prevalences of 4.4% and 4.9% respectively. Donors younger than 20 years recorded the highest prevalence of HBsAg [15.9% (34/214)] followed by those in age group $\geq 20 < 30$ [10.3% (170/1652)]. The highest prevalence rates of 6.1% and 5.0% for anti-HIV and anti-HCV were observed in age groups ≥ 50 and $\geq 30 < 40$ years respectively. The commonest co-infection occurrence was HBV-HCV [45.5% (10/22)].

Conclusion: The prevalence of the viral TTI agents studied among blood donors in the Kintampo municipality is relatively high. Co-infection with HBV and HCV was also high.

Keywords: Sero-prevalence; HIV; Hepatitis; Kintampo; Ghana.

1. INTRODUCTION

Blood transfusion contributes immensely to health service delivery particularly during supportive care for medical and surgical patients. The practice saves lives and improves health. There are however some medically important challenges associated with blood transfusion. One of such challenges is Transfusion Transmissible Infectious (TTI) agents. These infectious agents include hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV) and Human Pegivirus (HPgV). Human Immunodeficiency Virus (HIV), Human T cell Lymphotropic Virus (HTLV), West Nile Virus (WNV), Cytomegalovirus (CMV), syphilis, and malaria are also some examples of TTI agents [1]. Most TTI agents pose serious public health threats especially when blood recipients are at risk of contracting non-curable diseases such as HIV, HTLV, HBV and HCV [2].

Globally, approximately 35 million people are living with HIV [3]. Yearly, worldwide infection rate of HIV through blood transfusion alone range from 80,000 to 160,000 [4]. It has been estimated that over 350 million individuals worldwide are chronically infected with HBV, resulting in about 620,000 deaths per year [5]. The World Health organization (WHO) estimates that 3% (170 million) of the world's population is chronically infected with HCV [5].

Sub-sahara Africa (SSA) suffers greatly from infectious agents particularly HIV/AIDS. The regional prevalence is about 23.5 million which represents 69% of the global burden. New infections with HIV by the end of 2011 were 1.8 million [6]. The SSA has a high HCV prevalence rate (5-3%) while the West Africa sub-region suffers an estimated prevalence of 2.4% [7,8]. The disease is a common cause of non-A non-B viral hepatitis [9]. About 85% of persons infected with HCV develop into the chronic stage while approximately 15% of the infected patients clear the infection [10]. The prevalence of HBV infection among HIV-infected individuals is approximately ten times higher than in the general population, due to shared routes of transmission [11]. Existing evidence shows that HIV-positive individuals who subsequently are infected with HBV are more likely to become HBV chronic carriers, have a high HBV replication rate, and remain hepatitis B envelop antigen (HBeAg) positive for a much longer period [12].

There are varied reports on the prevalence rates of HBV, HCV and HIV among blood donors in Ghana. The prevalence of HBV among blood donors ranges between 9.6 % to approximately 12.0% in urban areas, and as high as 21% in rural communities [13-17]. The sero-prevalence of HCV has been reported to be between 1.3 and 8.4% among blood donors in Ghana [17-21]. The prevalence of HIV is between 1.5 and 3.8% among blood donors [17-19;]. However, the estimated national HIV prevalence in 2012 was 1.37% [22].

Even though these figures seem relatively low, there is the need to constantly maintain surveillance and sustain measures that will lead to the further reduction or possible elimination of these infectious agents particularly among the at risk populations.

One way of preventing the spread of these blood-related viral infectious agents is via safe blood transfusion. However, the challenge of unsafe blood transfusion continue to perpetuate in most developing countries partly due to logistics constrains and insufficient resource persons in the field of transfusion medicine [23]. In Africa alone, an estimated 250 to 500 people get infected with TTI agents daily [24,25]. This translates into approximately 90,000 to 180,000 cases of transfusion associated infection annually. The thorough screening of blood prior to transfusion therefore indispensably remains a critical medical process. However, the process undoubtedly does not only ensure that safe blood is transfused but also serves as an important platform for assessing the epidemiology of TTI agents in a particular locality, especially among the adult age group [26,27]. With this background, the current study focused on determining the prevalence of some viral TTI agents (HIV, HBV and HCV) among blood donors in the Kintampo Municipality.

2. METHODOLOGY

2.1 Study Area

The study was conducted in the Kintampo North Municipal Hospital. It is the only hospital in the municipality located in Kintampo, the capital of the Municipality. Kintampo is located within the Brong-Ahafo region of Ghana between latitude 8°45N and 7°45N and longitudes 1°20W and 2°1W, and it contains the geographical center of the country. The municipal district covers an area of 4,892.6 Km² and has a population of 95,480, with population density of 19.5 /Km².

2.2 Study Design

This was a retrospective hospital-based study conducted at the Laboratory unit of the Kintampo North Municipal Hospital. The hospital's laboratory uses one step immunochromatographic test kits (all from Premier Medical Corporation Limited, Dani Daman, India) to test for HBsAg, anti-HCV and anti-HIV sero-positivity. Known positive and negative samples are used to perform quality control checks on each batch of test kits received. All available archived results (from January 2010 to December 2012) on blood donation from the hospital's laboratory were reviewed manually. Data comprising age, sex and results of HBsAg, anti-HCV and anti-HIV tests on blood donors were reviewed. The data were double entered, validated for data entry errors and subsequently analyzed using Microsoft excel 2007 statistical package. Statistical analysis to measure significant associations and trends was done with GraphPad Prism version 5. In all cases *P* values <0.05 were considered significant.

3. RESULTS

Out of the 3402 people who were screened for blood donation, 3139 (92.3%) were males while 263 (7.7%) were females. The combined prevalence of HIV, HBV and HCV was 19.5% (613/3139) and 11.4% (30/263) for males and females respectively (Table 1). Hepatitis B infection was most common among the studied population with year-on-year prevalence of 9.6%. Hepatitis C and HIV recorded year-on-year prevalence of 4.4% and 4.9% respectively (Table 2).

Table 1. Gender specific prevalence rates of HIV, HBV and HCV among the study population

Gender	HIV %(n/N)	HBV %(n/N)	HCV %(n/N)	OVERALL %(n/N)
Male	5.0 (158/3187)	9.9 (310/3139)	4.6 (146/3152)	19.5 (613/3139)
Female	4.7 (10/215)	6.1 (16/263)	1.2 (3/250)	11.4 (30/263)
<i>P</i> value	.8409	.0448	.0107	.0012

n= number of positive cases, *N*= number of samples screened, HIV= Human Immunodeficiency Virus, HBV= Hepatitis B Virus, HCV= Hepatitis C Virus. *P* value <0.05 is considered statistically significant

Table 2. Yearly positivity and overall prevalence rates of HIV, HBV and HCV among the study population

Year	Samples screened (N)	HIV positive cases n (%)	<i>P</i> value	HBV positive cases n(%)	<i>P</i> value	HCV positive cases n(%)	<i>P</i> value	Total n (%)	<i>P</i> value
2010	1093	96(8.8)		120(11.0)		49(4.5)		265 (24.2)	
2011	1188	33(2.8)		114(9.6)		74(6.2)		221 (18.6)	
2012	1121	39(3.5)		92(8.2)		26(2.3)		157 (14.0)	
Total	3402	168(4.9)	<.0001	326(9.6)	.0267	149(4.4)	.0119	643 (18.9)	<.0001

HIV= Human Immunodeficiency Virus, HBV= Hepatitis B Virus, HCV= Hepatitis C Virus
P value <0.05 is considered statistically significant

Majority of the blood donors were within the age group 20-49 years. Donors younger than 20 years recorded the highest prevalence of HBV [15.9% (34/214)] followed by those in age group $\geq 20 < 30$ [10.3% (170/1652)]. The lowest HBV prevalence of 6.1% was observed among donors aged ≥ 50 years old. Prevalence rates of 6.1% and 5.0% for HIV and HCV were observed in age groups ≥ 50 and $\geq 30 < 40$ years respectively. Generally, prevalence rates among the various age groups ranged between 4.7-6.1%, 5.9-15.9%, and 2.3-5.0% for HIV, HBV and HCV respectively (Table 3). Co-infections were seen in 22 out of the 3402 blood donors. The highest occurrence of co-infection was HBV-HCV [45.5% (10/22)] while HIV1-HIV2 and HIV-HBV-HCV co-infections recorded a case each (Table 4).

Table 3. Age distributions of HIV, HBV AND HCV among the study population

Age(Years)	HIV %(n/N)	P value	HBV %(n/N)	P value	HCV %(n/N)	P value
<20	4.7 (10/214)		15.9 (34/214)		2.3 (5/214)	
$\geq 20 < 30$	4.7 (77/1652)		10.3 (170/1652)		4.2 (69/1652)	
$\geq 30 < 40$	5.1 (56/1094)		8.8 (96/1094)		5.0 (55/1094)	
$\geq 40 < 50$	5.6 (21/376)		5.9 (22/376)		4.5 (17/376)	
≥ 50	6.1 (4/66)	.3664	6.1 (4/66)	<.0001	4.5 (3/66)	.2020

n= number of positive cases, N= number of samples screened, HIV= Human Immunodeficiency Virus, HBV= Hepatitis B Virus, HCV= Hepatitis C Virus. P value <0.05 is considered statistically significant

Table 4. Prevalence rates of co-infections of HIV, HBV, and HCV among the study population

Type of Co-infection	Number positive	Frequency %
HIV – HBV	4	18.2
HIV – HCV	6	27.3
HBV – HCV	10	45.5
HIV1 and 2	1	4.5
HIV-HBV-HCV	1	4.5
Total	22	100.0

HIV= Human Immunodeficiency Virus, HBV= Hepatitis B Virus, HCV= Hepatitis C Virus

4. DISCUSSION

Blood transfusion is an important live-saving medical intervention globally. However, the challenges posed by this process continue to be a public health threat in most countries particularly those in the developing world. Our focus was to investigate the sero-prevalence of some viral TTI agents namely HBV, HCV and HIV among blood donors in the Kintampo Municipal Hospital of Ghana.

Out of the total number of blood donors (3402) screened for HBV, HCV and HIV, 18.9% were infected with at least one of these agents. The combined sero-prevalence of these infectious agents recorded in the present study is relatively high. Our findings suggest that approximately one in every five persons in the study population suffers at least one of these agents. Among these three viral agents investigated, the commonest was HBV, followed by HIV and then HCV. Some studies have reported similar findings [28,-31]. Even though there was general decline in prevalence rates for the individual viral agents, the reduction in the combined prevalence of the viral agents from 24.2% in 2010 to 14.0% in 2012 was statistically significant. However, the year-on-year prevalence of 18.9% is still on the high side (Table 2).

Following the stratification of the prevalence data into age categories, the study revealed higher prevalence of HBV among donors less than 20 years (15.9%). Donors in age groups $\geq 20 < 30$ years and $\geq 30 < 40$ years recorded prevalence rates of 10.5% and 8.8% respectively. The trend analysis performed showed that HBV infection significantly decreased with the advancement in age (Table 2). The infectivity of HBV seems to be skewed towards persons younger than 40 years of age as majority of the donors in this age group were HBsAg positive [13,32,33]. Contrary to our finding in HBV infection, the prevalence of HIV was higher in persons ≥ 50 years of age while individuals in age group $\geq 30 < 40$ years recorded the highest prevalence with regards to HCV. The variation in prevalence rates is dependent on the infectivity of the viruses as the routes of transmission of the three agents are similar. The infectivity of HBV is said to be 50 to 100 more infectious than HIV and 10 times more infectious than HCV [34,35].

There was vast difference in gender participation in blood donation. Majority of the people who donated blood were males similar to some studies conducted in Ghana [32,36,37]. Several reports have confirmed the gargantuan numerical variation between male and female blood donors [38,39]. Socio-cultural influences and beliefs have been reported as the major reasons for this bias [40,41,42]. However, apart from HIV, the prevalence rates recorded for HBV and HCV were significantly higher in males than females (Table 1). Generally, the overall prevalence of the three TTI agents studied was significantly higher in males than females.

Because the routes of infection of the three viral agents are similar, we hypothesized possible co-infections among the blood donors. However, only 22 cases out of the 643 registered various permutations of co-infection. The highest number of co-infection cases was HBV-HCV, followed by HIV-HCV and then HIV-HBV. Hepatitis B virus and HCV co-infection is relatively common as an estimated 7 to 20 million people suffer this condition globally [43]. The shared modes of transmission have been reported as the reason for most HBV-HCV co-infection [44]. However, super-infection seems to be the commonest cause of HBV-HCV co-infection [45]. Persons with either HIV-HBV or HIV-HCV co-infection stand a greater risk of proceeding at a faster rate to developing hepatocellular carcinoma as the immune system deteriorates rapidly [46,47].

5. CONCLUSION

The study indicated that 18.9 % of the blood donors screened were infected with at least one of the viral transfusion transmissible infectious agents investigated. This suggests one in every five blood donors in the Kintampo municipality harbours a form of viral TTI agent. HBV-HCV co-infection was found to be relatively common among the donors. The relatively high prevalence of viral TTI agents observed in the study suggests both vertical and horizontal transmissions of the agents are common. The possibility of occult transmission cannot be underrated. More stringent measures should be employed in both the selection and screening of blood for transfusion.

ETHICAL APPROVAL

The study was approved by the research and fieldwork unit of the College of Health and Well-Being, Kintampo. In addition, permission to undertake the study in the Kintampo Municipal Hospital was granted by the hospital authorities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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