Global Journal of
Health Science
(GJHS)

Prevalence and Factors Associated with Hepatitis B and Human Immunodeficiency Virus Co-Infection among Blood Donors in Kenyan Coastal Region

Alice June Akoth, Dr. Suleiman Mzee, Prof. Kikuvi G.M., Mary Kerich and Dr. Magret Oduor

IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

Global Journal of Health Sciences
ISSN xxxx-xxxx (Paper) ISSN 2519-0210 (Online)
Vol.1, Issue 2 No.1, pp 27 - 42, 2016

www.iprjb.org

Prevalence and Factors Associated with Hepatitis B and Human Immunodeficiency Virus Co-Infection among Blood Donors in Kenyan Coastal Region

***[1]Alice June Akoth, [2] Dr. Suleiman Mzee, [3]Prof. Kikuvi G.M., [4]Mary Kerich and [5]Dr. Margret Oduor**

[1]Post graduate student, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200 Nairobi

[2]Senior Lecturer, Technical University of Mombasa, P.O. Box 90420-80100 Mombasa

[3]Professor, Department of Public and Community Health, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200 Nairobi

[4]Senior Lecturer, Jomo Kenyatta University of Agriculture and Technology

[5]Director, Kenya National Blood Transfusion Service

Corresponding email address: juneakoth@gmail.com

Abstract

Purpose: Prospective studies on blood transfusion has shown that transfusion-transmissible infections (TTIs) has heralded a new era in blood transfusion practices worldwide. The blood transfusion practice emphasizes on two fundamental objectives: 1.) safety and 2.) Protection of human life. Infection with Human Immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) is a serious global public health problem. In Africa and Asia, they remain a major cause of morbidity and mortality. Therefore, a great concern in safety of blood and blood transfusion practices.

Methodology: We estimated incidence and prevalence by age, sex, county, level of education and occupation with a wide range of updated and standardized analytical procedures. This was a descriptive cross-sectional study. Prevalence and incidence by cause and sequelae were determined through descriptive analysis, cause-effect and significance of relations through MANOVA, X^2 and t-test, alternative modelling strategies for disease burden were determined from other data source. This study determined the prevalence of HIV, HBV, HIV-HBV Co-infection and factors associated with HIV- HBV co-infections among blood donors in Coastal region, Kenya. Four hundred and twenty respondents participated in the study. Donors were divided into six age groups, and age range was from 15 to 64 years, of which 71% (298) were male and 29% (122) female.

Results: The study showed prevalence of 3.1% and 1.43% for HBV and HIV respectively among the blood donors.

Policy recommendation: A targeted awareness and education for males on HIV, HBV prevention should be protracted to increase blood safety. Promoting the culture of voluntary donors, recruitment of female blood donors and proper testing of donor's blood by using standard methods are recommended.

Keywords: *Prevalence of HIV, Hepatitis B, Human Immunodeficiency Virus, Co-Infection, blood donors*

Background Information

Hepatitis B virus (HBV) and human immunodeficiency virus (HIV) are blood borne viruses transmitted primarily through sexual contact and injection drug use. Because of these shared modes of transmission, a high proportion of adults at risk for HIV infection are also at risk for HBV infection. HIV-positive persons who become infected with Hepatitis B virus (HBV) are at increased risk for developing chronic HBV infection and should be tested. In addition, persons who are co-infected with HIV and HBV can have serious medical complications, including an increased risk for liver-related morbidity and mortality (WHO, 2013).

Co-infection with hepatitis B virus (HBV) and HIV is common, with 70-90% of HIV-infected individuals in the United States having evidence of past or active infection with HBV. Factors affecting the prevalence of chronic HBV include age at time of infection and mode of acquisition, which vary geographically. In the United States and Western Europe, HBV often is acquired in adolescence or adulthood via sexual contact or injection drug use. Although spontaneous clearance of HBV acquired in adulthood occurs in >90% of immune-compromised individuals (WHO, 2013)

Both HBV and HIV are endemic, or even hyper endemic, in the Black population of sub-Saharan Africa, with as many as 20% of the population living in the sub-continent being co-infected with the two viruses. In the only study conducted in the sub-continent in which occult HBV infection has been evaluated in patients with HBV/HIV-1 co-infection, the number of patients co-infected with HBV and HIV-1 increased from 4.8% without testing to 12.4% with testing (WHO, 2013).

Since 1930, blood has been used for various indications. Introduction of blood banks and better storage techniques, blood transfusion has become more widely used. Approximately 160,000 units of blood are collected annually in Kenya, of which 95% are from Voluntary donors. Blood is one of the major sources of transmission of Hepatitis B, HIV and many other diseases.

Statement of the problem

Human immunodeficiency virus (HIV) and hepatitis virus (HBV) are of great concern because of their prolonged viraemia and carrier or latent state. HIV-Hepatitis co-infection is of public health importance because it leads to greater morbidity than either of the two diseases alone and affects many people. It also causes fatal, chronic and life-threatening disorders. In developing countries, liver disease due to chronic HBV has become a growing problem, particularly in those infected with HIV; therefore, it is important to document HIV co-infections in regions with high hepatitis chronicity and HIV infection rates (Matthews, Geretti, Goulder & Klenerman, 2014).

HIV-HBV co-infection are reported as high as 10–20% in countries where HBV infection is either endemic or intermediate to high HBV cases (Inoue & Tanaka, 2016). Co-infections with HBV and HIV-1 are common, not only due to shared modes of transmission of the viruses, but also because HIV-1 infection causes multi-dimensional immune suppression, which reduces the probability of spontaneous recovery from HBV infection (Liver disease is now the leading cause of morbidity and mortality in individuals co-infected with the two viruses (Palella, Baker, Moorman, Chmiel, Wood & Brooks, 2006). Thus, continuous monitoring of the magnitude of transfusion-transmissible infections in blood donors by determining prevalence and factors associated with HIV- Hepatitis co- infection is important for estimating the risk of transfusion and optimizing donor recruitment strategies to minimize infectious diseases transmission and this can be used a surrogate measure of the population to determine the burden of these condition in the general public and to initiate a preventive measure to curb the menace especially with the advent of ARVs which directly has an impact on the liver and hepatitis also as a disease affects the liver which can cause more harm (WHO, 2013).

The risk of HIV transfusion through infected blood products exceeds that of any other risk exposure. Ninety percent of recipients transfused with HIV antibody-positive blood are found to be HIV infected at follow-up. The 90% probability of seroconversion is independent of the age or sex of the recipient, HIV infection resulting from blood transfusion has been documented repeatedly since the first case report in late 1982 (Pozen, 2003). As of December 2001, an estimated 14,262 persons have been diagnosed with AIDS as a result of transfusing contaminated blood or blood products (CDC, 2003)

In Kenya, study done on Prevalence of hepatitis B and C viral co-infections among HIV-1 infected individuals in Nairobi, Kenya, revealed a prevalence of 18% HIV-HBV co-infection (Matthews *et al.*, 2013). No study has been done in coastal Kenya to determine the magnitude of the HIV-HBV co-infection in the coastal Kenya.

Material and Methods

Study Area

The study was carried out at the Regional Blood Transfusion Centre, Mombasa which serves Mombasa, Kilifi, Kwale, Taita-Taveta and Lamu counties. Approximately 1200 units of blood are collected every month across the counties, therefore a good catchment area to give a good representation of the coastal region and the laboratory in the centre was used as testing site for the for the markers (HIV and HBV).

Study Design

The study was descriptive and cross-sectional in nature, through this the researcher was able to make inferences to broader populations and permit them to generalized findings to real life situations thus increasing the external validity of the study.

Study Population

Blood donors both relative (those donors who volunteered because they had a sick relative) and voluntary donors who visited Regional Blood Transfusing Centre Mombasa and all the county hospitals within the former coast region (Mombasa, Taita Taveta, Lamu, Kwale, Kilifi and Tana River) and consented were enrolled to the study.

Inclusion and Exclusion Criteria

Inclusion criteria

- All blood donors aged between 15 -64 years
- Blood donors who consented to the study were enrolled

Exclusion criteria

- All Donors aged 14 years and below and those above 65 years
- Those who did not consent

Sample Size Determination

The sample size was calculated using Cochran sample size determination formula. A sample of 420 samples was used during the study.

Sampling Technique

The study employed consecutive sampling technique, whereby participants were selected as they presented themselves for blood donation. Consecutive sampling technique involves selecting all individuals who agree to participate, provided they meet pre-established criteria, until the number of subjects desired has been recruited.

Data and Sample Collection Procedure

Data was collected using a questionnaire designed for the study which included personal data, occupation, area of residence, education level, religion and knowledge on hepatitis as HIV is widely known due to the global impact and its declaration as a national disaster in Kenya in 1999. Research assistants were used to administer the questionnaire (Health officers at the Regional Blood transfusion center and Laboratory staff at the county Hospitals).

Data Processing and Analysis Technique

Data was coded and entered in an excel sheet and verified. Descriptive statistics were analyzed using Microsoft Excel 2010 and SPSS version 22. Student t test and chi Square was used to determine the difference in the factors between co- infected and mono infected. Odds ratios (OR) and 95% confidence Intervals (CI) at P value ≤ 0.05 in univariate analysis. Multiple logistic regression was used for multivariate analysis to determine the independent factors for exclusively HBsAg (+) and HIV (+) co-infected.

Ethical Consideration

This study was approved by Kenya National Blood Transfusion Management and Pwani University Ethical committee. All participants voluntarily enrolled to the study and signed an informed consent form was witnessed which by the health officer who attended to the donor and appended their signature before collection of data and blood samples.

RESULTS

Socio Demographic and Socio-Economic characteristics of Respondents

There were 420 respondents enrolled into the study, of which 71% (298) were male and 29% (122) female. The respondents were categorized as per the county of residence at the time of study. The counties were drawn from the former Coast province which included Mombasa, Kilifi, Kwale, Tana River, Taita Taveta and Lamu as indicated in Table 1. The respondents were divided into six

age groups; the age range was from 15 to 64 years (Median age group was 25-34yrs). Out of the 420 respondents, 152 were repeat donors (have donated more than twice in their lifetime).

Table 1 Distribution of Respondents as per County

County	Frequency	%	Male %	Female %
Kilifi	89	21.2	16.9	4.3
Kwale	81	19.3	12.6	6.7
Lamu	22	5.2	4.8	0.5
Mombasa	113	26.9	17.9	9
Taita Taveta	92	21.9	13.8	8.1
Tana River	23	5.5	5	0.5
Total	**420**	**100.0**	**71**	**29**

In relation to marital status, of the total 420 respondents, 52.9% were single with males being more than females (66.7% males and 33.3% females). Married respondents were 44.5% (75.9% males and 24.1% females), Divorced and Widowed were paltry 1.7% and 1% respectively with most of them being males.

In terms of occupation, majority of the respondents from a single category were students at 27.4% (65.2% males and 34.8% females), combined category of formal employment that includes (teachers, nurses, managers, IT office, security, police and mechanics) were 32.2% with males (85.19% males and 14.81% females). Others were housewives 3.8% traders 12.1% unemployed 4.3% and informal sector (farmers, hawkers, drivers, casuals and fishermen) 20.2%. The table 2 social demography below provides the frequency.

Table 2 Social Demography

		Frequency	%
Marital Status	Single	222	52.9
	Married	187	44.5
	Divorced/Separated	7	1.7
	Widowed	4	1.0
	Total	**420**	**100**
Education	None	16	3.8
	Primary	26	6.2
	Secondary	118	28.1
	Tertiary	260	61.9
	Total	**420**	**100**
Occupation	Casual	32	7.6
	Driver	17	4.0
	Farmer	13	3.1

		Frequency	%
Marital Status	Single	222	52.9
	Married	187	44.5
	Divorced/Separated	7	1.7
	Widowed	4	1.0
	Total	**420**	**100**
Education	None	16	3.8
	Primary	26	6.2
	Fisherman	12	2.9
	Hawker	11	2.6
	Housewife	16	3.8
	IT Office	47	11.2
	Manager	7	1.7
	Mechanic	27	6.4
	Nurse	1	.2
	Policeman	3	.7
	Security	32	7.6
	Student	115	27.4
	Teacher	18	4.3
	Trader	51	12.1
	Unemployed	18	4.3
	Total	**420**	**100**

Prevalence of HIV among Study Respondents

Among the respondents, six out of the 420 respondents were infected with HIV representing an overall prevalence of 1.40% (6/420). Out of the six HIV infected, four were males representing 1.34% prevalence (4/298) and 1.63% (2/122) among the female respondents.

HIV Prevalence Based on Age, Sex and Marital Status

The respondents were divided into six cohorts based on age and sex, the age range was from 15 to 64 years. HIV prevalence among the males in the specific age group of between 15- 24 years had the highest prevalence within sex of 50% and overall 33% of the study respondents. Females in the age group 25-30 years and 45- 54 years had 100% of within sex prevalence with each group having 50% each (each group had 16.7% prevalence respectively for the age groups in the overall prevalence of the respondents), females in the age group 15-24 had 0% prevalence. The overall highest HIV prevalence was observed in the age group 25- 34 years with 36% followed closely with 15- 24 years' group with 36.5% prevalence and the least being 45- 54 with 8.5%. However, the overall prevalence of the general study respondents was lower as indicated in Table 3.

Table 3 HIV Infection per Age, Sex and Marital Status

Characteristic		HIV STATUS	
		% Positive	% Negative
Gender	Male	1	70
	Female	0.5	28.5
Age	15-24	0.5	29.5
	25-34	0.5	36
	35-44	0	20.2
	45-54	0.5	8.3
	55-64	0	4.5
	Total	1.4	98.6
Marital Status	Single	0.7	52.1
	Married	0.5	44
	Divorced/Separated	0.2	1.4
	Widowed	0	1
	Total	1.4	98.6

High HIV sero-prevalence was recorded among the divorced/separated with 14.3% prevalence (1/7), married had sero-prevalence of 1.1% and 1.4% for singles. There was no infection among the widows.

Prevalence of HBV among Study Respondents

Out of the 420 respondents of the study, 13 were infected with hepatitis B representing 3.1% prevalence (13/420). There were ten males and three females who were infected with HBV, Prevalence of HBV was higher among the male respondents than the females with 2.6% and 0.5% respectively. The table 4 indicates the frequency distributions.

Table 4 HBV Infection as per Age, Sex and Marital Status

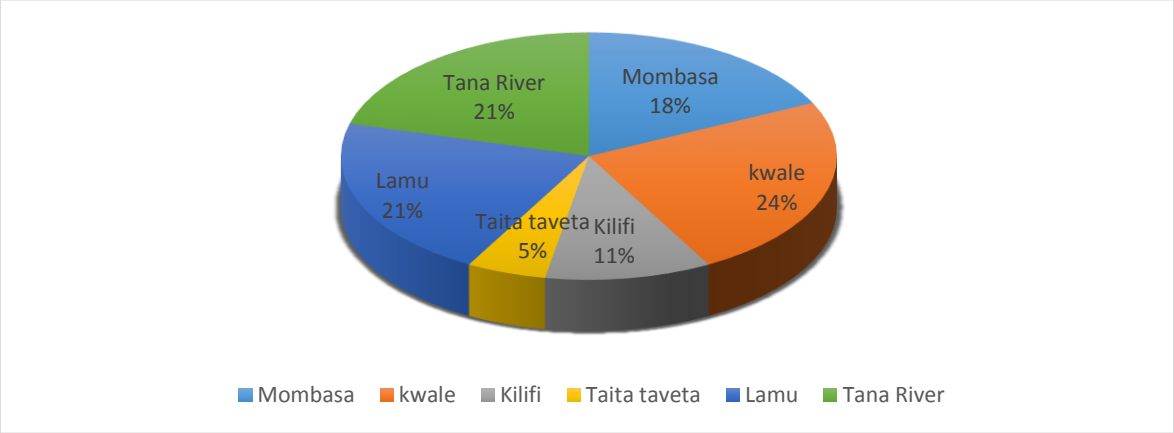
Characteristic		**HBV STATUS**	
		% Positive	**% Negative**
Gender	Male	2.6	68.3
	Female	0.5	28.6
Age	15-24	0.5	29.5
	25-34	1.4	35
	35-44	0.7	19.5
	45-54	0.3	8.6
	55-64	0.2	4.3
	Total	**3.1**	**96.9**
Marital Status	Single	0.7	52.1
	Married	1.9	42.6
	Divorced/Separated	0.2	1.4
	Widowed	0.2	07
	Total	**3.1**	**96.9**

The results show that among the respondents, individual with Hepatitis (HBV) aged between 25-34 years male accounted for 46.2% of the overall infection giving the highest prevalence among the categories of 1.4% followed by 34-44 years who accounted for 0.7% (males 23.1% and females 0%). However, women were found in the ages 15-24 years and 45-54 years both with 7.7% prevalence. High HBV sero-prevalence was recorded among the married with 1.9% followed by single 0.7% and lowest among divorced/separated and widowed at 0.2%.

Prevalence of HBV per county

Kwale County had the highest prevalence of hepatitis B (5.1%), with Lamu and Tana River at 21% and 21% respectively, Taita Taveta County had the lowest prevalence of HBV (Figure 1). Mombasa County and Kwale County had the highest prevalence in HIV with 18% and 24% respectively.

Figure 1 Prevalence of HBV per County



HIV-HBV Co-Infection Prevalence Based on Age, Sex and Marital Status

Table 5 below gives a summary of the analysis.

Table 5 HBV/HIV Coinfection Prevalence based on age, sex and marital status

Characteristic		HBV/HIV Co-infection STATUS	
		% Positive	% Negative
Gender	Male	0.2	70.7
	Female	0.2	28.8
Age	15-24	0.2	29.8
	25-34	0	36.4
	35-44	0	20.2
	45-54	0.2	8.6
	55-64	0	4.5
	Total	**0.5**	**99.5**
Marital Status	Single	0.2	52.6
	Married	0.2	44.3
	Divorced/Separated	0	1.7
	Widowed	0	1
	Total	**0.5**	**99.5**

The results show that among the respondents, co-infection was observed among respondents aged between 15 -24 years and 45-54 years, of whom were all males. There was no co-infection among the females.

HIV, HBV and HBV-HIV Co-Infection prevalence based on geographical area (county)

There was no HIV infection among the Kilifi, Tana River and Lamu Counties respondents, Mombasa County had the highest percentage of 0.7% of the total HIV prevalence followed closely by Kwale County with 0.5% prevalence HBV infection was high in Mombasa and Kwale County with 1% each of the overall prevalence followed by Kilifi County with 0.5%. Tana River, Lamu and Taita Taveta had 0.2% prevalence of the overall HBV prevalence each. HIV-HBV Co-infection was observed in Mombasa and Kwale Counties (Table 6).

Table 6 Distribution of HIV, HBV, Coinfection by Counties

	Mombasa	Kilifi	Kwale	Tana River	Lamu	Taita Taveta	Total
HIV Infection	0.7%	0.0	0.5	0.0	0.0	0.2	1.4%
HBV/HIV Co-infection	0.2%	0.0%	0.2%	0.%	.0%	0.0%	0.5%
HBV	1.0%	0.5%	1.0%	0.2%	0.2%	0.2%	3.1%

Awareness and Practice of the Study Respondents on Hepatitis

A total of 243 donors answered yes to having heard of hepatitis and 177 had not heard of it prior to the donation time, out of the 243 who had heard of hepatitis B, seven were infected with HBV giving a prevalence of 2.9% among them and 2.5% prevalence among those that had knowledge prior. Table 7 shows different sources in which the donors heard about the disease and distribution of infection among the respondents. None of the respondents who answered yes to having had of hepatitis had HIV-HBV co-infection.

Table 7 Source of information and distribution of HBV infection among respondents who answered yes

Avenue	Number	HBV+
Newspapers and magazine	10	2
Radio	0	0
Television	0	0
Brochure, posters and other printed materials	211	4
Family, friends, neighbors and colleagues	22	1
Other	0	0
Total	243	7

Socio Demographic relationship among study respondents

The results indicate there was no significant difference in the mean for HIV, HBV and HBV-HIV Co-infection if controlled for Age at 2.214 and HIV 1.986, HBV 1.969 and HBV-HIV Co-infection 1.995, this therefore indicates that the means are normally distributed among the test subjects for HIV, HBV and HBV-HIV co-infection. When controlled for Sex the results show there was slight differences in the means, Sex at 1.290 and HIV 1.986, HBV 1.969 and HBV-HIV Co-infection 1.995. Given that the confidence interval lies between 0.0 as shown by the results, we therefore fail to reject the null hypothesis that there are no significant differences age or sex wise between the people infected by either HBV or HIV or HBV-HIV based on the score of the means. Table 8 below provide summary of the analysis.

Table 8 One-sample t-test for relationship between HIV, HBV and HBV-HIV

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Age	41.103	419	.000	2.214	2.11	2.32
Sex	58.186	419	.000	1.290	1.25	1.33
Have HIV	342.529	419	.000	1.986	1.97	2.00
Age	41.103	419	.000	2.214	2.11	2.32
Sex	58.186	419	.000	1.290	1.25	1.33
Have Hepatitis	232.725	419	.000	1.969	1.95	1.99
Age	41.103	419	.000	2.214	2.11	2.32
Sex	58.186	419	.000	1.290	1.25	1.33
Have HIV and HBV	593.264	419	.000	1.995	1.99	2.00

When the same categories were controlled for marital status, the results show similar mean difference of marital status at 1.507, HIV 1.986, HBV 1.969 and HBV-HIV 1.995 which were no different to other socio demography to indicate there were no significance difference in relation to HIV, HBV or HBV-HIV among the study respondents based on their mean score that the prevalence might not be higher or lower based on category of marital status i.e. single, married, divorced/separated or widowed. Table 9 provide summary.

Table 9 One-sample t-test for relationship between HIV, HBV and HBV-HIV

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Marital Status	52.875	419	.000	1.507	1.45	1.56
Have HIV	342.529	419	.000	1.986	1.97	2.00
Have Hepatitis	232.725	419	.000	1.969	1.95	1.99
Have HIV and HBV	593.264	419	.000	1.995	1.99	2.00

X^2 was used to test the relationship between 2 or more variables mainly (scale and categorical). The significance value (Asymp. Sig.) provided the information, where the lower the significance value, the less likely it is that the two variables were independent (unrelated). In this case as indicated in table 10, where the significance value is so low that it is displayed as .000, means that it would appear that the two variables are, indeed, related. We tabulated variables set in frequencies and tests observed, either a common expected value or a customized set of expected values. This basically means that the number of people expected to have HIV and HBV are no different what is actually found from the results. The results indicate as follows, the correlation between HIV, HBV-HIV and marital status were insignificant as 0.986 and 0.501 were greater than 0. However, for HBV the significance interval was .002 which showed a stronger relation between HBV and marital status meaning that marital status determined the prevalence of HBV or HBV prevalence has a trigger factor dependent on marital status.

Table 10 X^2 test for relationship between HIV, HBV and HBV-HIV

		Marital Status	Have either HIV, HBV or co-infection
Marital Status	Pearson Correlation	1	.001
	Sig. (2-tailed)		.986
Have HIV and HBV	Pearson Correlation	.001	1
	Sig. (2-tailed)	.986	
Marital Status	Pearson Correlation	1	-.033
	Sig. (2-tailed)		.501
Have HIV	Pearson Correlation	-.033	1
	Sig. (2-tailed)	.501	
Marital Status	Pearson Correlation	1	-.151**
	Sig. (2-tailed)		.002
Have Hepatitis	Pearson Correlation	-.151**	1
	Sig. (2-tailed)	.002	

**. Correlation is significant at the 0.01 level (2-tailed).

The results showed there were no significant difference in the means if fixed factor marital status was considered jointly on intercept (dependent variables) HIV, HBV and HBV-HIV. Meaning the infection rates were no different based on category of marital status i.e. single, married, divorced/separated or widowed. Result shown in table 11.

Table 11 Estimated margin means for marital status

Dependent variable (marital status)	HIV	HBV	HBV-HIV
Single	1.982	1.968	1.996
Married	1.987	1.932	1.989
Divorced/Separated	1.933	1.800	2.000
Widowed	2.000	1.667	2.000

When the fixed factor sex is considered, the results indicate there is no significant difference in the infection prevalence among males and females when considered jointly on variable HIV, HBV and HBV-HIV. Wilks λ=0.994, F (3,416) =0.994, p=.455, partial n^2=.006. However, the intercept indicates that if the variable is considered separately then the difference is significant across sex as follows Wilks λ=0.001, F (3,416) =0.001, p=.000, partial n^2=.999.

Table 12 Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.999	96029.870[a]	3.000	416.000	.000	.999
	Wilks' Lambda	.001	96029.870[a]	3.000	416.000	.000	.999
	Hotelling's Trace	692.523	96029.870[a]	3.000	416.000	.000	.999
	Roy's Largest Root	692.523	96029.870[a]	3.000	416.000	.000	.999
SEX	Pillai's Trace	.006	.873[a]	3.000	416.000	.455	.006
	Wilks' Lambda	.994	.873[a]	3.000	416.000	.455	.006
	Hotelling's Trace	.006	.873[a]	3.000	416.000	.455	.006
	Roy's Largest Root	.006	.873[a]	3.000	416.000	.455	.006

A separate ANOVA was conducted for each dependent variable, with each ANOVA evaluated at an alpha level of .025. There was no significant difference between male and female on HIV F (1,418) =0.54, P=0.816, partial n^2=.000 with females (m=1.98) scoring no higher than males (m=1.99); HBV F (1,418) =1.213, P=0.271, partial n^2=.003 with females (m=1.98) scoring no higher than males (m=1.96); and HBV-HIV F (1,418) =0.426, P=0.514, partial n^2=.001 with females(m=1.99) scoring no higher than males (m=2.000). Table 13 below provides the summary of the analysis.

Table 13 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
SEX	Have HIV	.001	1	.001	.054	.816	.000
	Have Hepatitis	.036	1	.036	1.213	.271	.003
	Have HIV and HBV	.002	1	.002	.426	.514	.001
Error	Have HIV	5.914	418	.014			
	Have Hepatitis	12.561	418	.030			
	Have HIV and HBV	1.988	418	.005			

Socio-Economic relationship among study respondents

Socio economic relationship among study respondents was first considered based on occupation. Occupation was considered as a fixed factor against dependent variable HIV, HBV and HBV-HIV. The results indicate there is no significant difference in the infection prevalence across occupation when considered jointly on variable HIV, HBV and HBV-HIV. Wilks λ=0.906, F (.900, 45) =0.906, p=.662, partial n^2=.032, meaning they are normally distributed. However, the intercept indicates that if the variable is considered separately then the difference is significant across occupation as follows Wilks λ=0.004, F (3,402) =0.004, p=.000, partial n^2=.996. Meaning that if a particular occupation is considering against a particular infection either HIV, HBV or HBV-HIV separately and not jointly then the difference is significant at P-value=0.000.

Table 14 Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.996	33836.087[a]	3.000	402.000	.000	.996
	Wilks' Lambda	.004	33836.087[a]	3.000	402.000	.000	.996
	Hotelling's Trace	252.508	33836.087[a]	3.000	402.000	.000	.996
	Roy's Largest Root	252.508	33836.087[a]	3.000	402.000	.000	.996
OCCUP	Pillai's Trace	.097	.900	45.000	1212.000	.661	.032
	Wilks' Lambda	.906	.900	45.000	1195.020	.662	.032
	Hotelling's Trace	.101	.899	45.000	1202.000	.663	.033
	Roy's Largest Root	.054	1.459[b]	15.000	404.000	.117	.051

A separate ANOVA was conducted to determine each subject effects and also evaluated at an alpha level of .025 for each ANOVA. There was no significant difference in occupation if considered for HIV F (15,404) =1.326, P=0.183, partial n^2=.047; if considered for HBV F (1,404) =0.787, P=0.693, partial n^2=.028; and if considered for HBV-HIV F (15,404) =1.088, P=0.365, partial n^2=.039. All the 3 variables had a mean of between 1.97 and 2.00 which was not significantly different meaning they were normally distributed.

Table 15 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
OCCUP	Have HIV	.277	15	.018	1.326	.183	.047
	Have Hepatitis	.358	15	.024	.787	.693	.028
	Have HIV-HBV	.077	15	.005	1.088	.365	.039
Error	Have HIV	5.637	404	.014			
	Have Hepatitis	12.240	404	.030			
	Have HIV-HBV	1.913	404	.005			

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Discussion

Among the 420 respondents, six were infected with HIV presenting 1.4% (6/420) The Prevalence of this infection was low compared to WHO Sub Saharan Africa HIV prevalence rate of adults aged 15 to 49 of 5.3% (4.7% - 6.1%) 5.9% (4.9%-7%) for Kenya, Reduction in prevalence among the respondents could be due to the stringent donor selection criteria enforced by Blood Transfusion centre to reduce the rate of sero-positivity by the use of donor questionnaire which seeks to establish donor history, exposure and risk behavior.

Prevalence of 3.1% for HBV in this study was equally low compared to WHO Sub Saharan Africa prevalence of HBV at 10% (WHO, 2010). This could be attributed to the stringent measures put in place in donor selection criteria. This can also be seen when comparing study do by Glennah

Kerubo1 on Hepatitis B, Hepatitis C and HIV-1 Co-infection in Two Informal Urban Settlements in Nairobi, Kenya (2015) which had prevalence13.3% for HBV which is significantly higher than our finding of 3.1%.

HIV-HBV co-infection was at a prevalence of 0.48% (2/420). Prevalence among the male respondents was at 0.67%, no female was co-infected. The high prevalence of HBV in males is probably due to lifestyle variations between the gender groups or due to high number of male donors who turn up for blood donation.

Factors associated with HIV-HBV co-infection in this study observed included age, gender, marital status, education level, geographical area and occupation. Significant associated factors among the respondents to HIV-HBV co-infection were: marital status, age of 30 years and above, HIV infection, practice of unsafe sex, unemployment and geographical area, age of 31 years and above, presence of HIV infection and practice of unsafe sex were found to have an effect on the presence of HIV- HBV co- infection.

Conclusion

The aim of this study was to investigate the prevalence of HIV and HBV coinfection among blood donors in the Kenyan Coast. HBV Infection prevalence was higher depending on marital status with married individuals showing significance at p-value=0.002 suggesting a higher-risk in this group. Taken together, these findings will contribute significantly to ongoing efforts to improve transfusion-related haemovigilance in blood recipients and general blood transfusion practices. The results also showed a higher prevalence among the males as compared to the females, notwithstanding that males are the majority blood donors, this study will therefore help in targeting males to ensure they are properly reached with key messages and education in wider efforts to increase blood safety.

Recommendation

A targeted awareness and education for males on HIV, HBV prevention should be protracted to increase blood safety. This is shown by the results of the study that males have a higher prevalence for HIV, HBV and coinfection as compared to the females. Males are also the biggest blood donors.

Promoting the culture of voluntary donors, recruitment of female blood donors and proper testing of donor's blood by using standard methods are recommended. The finding of the research indicated that the perceptions toward blood donation could be influenced to a large extent by knowledge significantly related with the occupation, practice and education among the general population. The regular flow of voluntary blood donors will have a cumulative effect on the different strata of society leading to a reduction in unnecessary fear associated with voluntary blood donation. Understanding blood donor motivations is crucial to improving effectiveness of donor recruitment and retention programs.

REFERENCES

World Health Organization (WHO) (2013): Hepatitis B. Fact sheet Number 204.

World Health Organization (WHO) (2015) Guidelines for the Prevention, Care and Treatment of Persons with Chronic Hepatitis B infection.

Gicheru, M. M., Muriuki, B. M., Wachira, D., Nyamache, A. K., & Khamadi, S. A. (2013). Prevalence of Hepatitis B and C Viral Co-Infections among HIV-1 Infected Individuals in Nairobi, Kenya.

Matthews, P. C., Geretti, A. M., Goulder, P. J., & Klenerman, P. (2014). Epidemiology and impact of HIV coinfection with hepatitis B and hepatitis C viruses in Sub-Saharan Africa. *Journal of clinical virology*, *61*(1), 20-33.

Inoue, T., & Tanaka, Y. (2016). Hepatitis B virus and its sexually transmitted infection–an update. *Microbial Cell*, *3*(9), 419-436.

Pozen A. Contamination of the blood supply in the 1980s and 1990s (2003) Ann Intern Med. 2003 Jan 7;138(1):78-9.

Palella FJ, Jr., Baker RK, Moorman AC, Chmiel JS, Wood KC, Brooks JT, (2006): *Mortality in the highly active antiretroviral therapy era: changing causes of death and disease in the HIV outpatient study. J Acquir Immune Defic Syndr. 2006; 43(1):27-34*. [DOI] [PubMed]

CDC HIV Statistics (2003) www.cdc.gov/hiv/stats.htm#exposure (accessed March 23, 2003)