Knowledge and Awareness of Hepatitis B Virus, Hepatitis C Virus and Human Immunodeficiency Virus Infections through Infection Status of Blood Donors within the Kumba Health District, South West Region, Cameroon

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ABSTRACT

Knowledge and Awareness of Hepatitis B Virus, Hepatitis C Virus, and Human Immunodeficiency Virus Infections through the Infection Status of Blood Donors within the Kumba Health District, South West Region, Cameroon

In 2015, the global estimated burden of chronic infections with hepatitis B virus (HBV) and hepatitis C virus (HCV) was 257 and 71 million people, respectively, with majority of the cases occurring in developing countries including those in the sub-Saharan African region where 68% of the world's human immunodeficiency virus (HIV) cases are found. Cameroon is one of the countries in this region and has been known to be endemic for both of these infections, with a pooled prevalence of 11.2% and 6.5% for HBV and HCV, respectively. However, like most other sub-Saharan African countries where HIV has been predominant and concerned with great public health efforts, awareness and control of HBV and HCV infections have been in lack. Awareness and knowledge of these infections are essential in building advocacy and reducing spread especially among blood donors in this country because despite the high demand for blood and blood products, this subpopulation have shown consistently high prevalence for both HBV and HCV infections. Therefore, this study investigated the knowledge and awareness of these infections among blood

donors to give basic information for planning on effective control.

A cross-sectional study was conducted among adults who visited four major hospitals within the Kumba Health District for blood donation, from November 2017 to March 2018. Participation was voluntary after the subjects provided verbal informed consent. Information on knowledge and awareness on HBV, HCV, and HIV infections were collected with structured questionnaires, whereas the infection status of the participants were identified from the result of serologic tests done in the respective blood donation units.

A total of 712 donors were included in the study (male, 619; female, 93; age range, 17-68 years), with a participation rate of approximately 100%. HBV, HCV, and HIV infection prevalence was 12.8%, 4.6%, and 6.6%, respectively. Coinfections were highest between HIV and HBV (1.7%, 12 cases), followed by HIV and HCV (0.7%, 5 cases), and HBV and HCV (0.3%, 2 cases). Furthermore, only 6.5% of donors reported to have received HBV vaccination. Approximately half of the respondents were aware of HBV (53.6%) and HCV (45.9%) infections, with no significant difference by gender, whereas it was 99.9% for HIV. Furthermore, knowledge assessment showed that only 48% and 37.6% of the donors had adequate knowledge on HBV and HCV, respectively, whereas it was 99.2% for HIV. Knowledge on modes of transmission, treatment, and vaccine availability were the most lacking among donors. Predictors of awareness, knowledge, and infection status were determined using logistic regression only among male participants owing to the relatively smaller size of female participants. Education level (high school: OR=5.19, 95% CI=2.94, 9.17;

university or postgraduate: OR=41.49, 95% CI=19.10, 90.11), health information–seeking behavior (OR=1.74, 95% CI=1.14, 2.65), HBV vaccination status (OR=2.21, 95% CI=1.08, 6.47), experience in infectious disease education (hepatitis: OR=7.53, 95% CI=1.57, 36.17), and experience in blood donation (≥2 times: OR=2.03, 95% CI=1.16, 3.55) were the most significant correlates for knowledge of HBV infection among male participants, and it was similar for HCV. By the infection status, male donors who tested negative for HBV were 1.92 times (95% CI: 1.19-3.09) more likely to have good knowledge on HBV than those who tested positive, after adjusting for age. Sexual experience with two or more partners was the most significant predictor for a positive infection status for all three infections among male donors.

The knowledge and awareness of HBV and HCV were low, whereas the prevalence of these infections was high among the population of blood donors within the Kumba Health District of Cameroon. There is an urgent need to raise awareness and disseminate appropriate knowledge to blood donors and the general population to encourage positive attitudes, promote healthy behaviors, and therefore reduce the spread of these infections.

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1. Introduction

1.1 Understanding the basics of HBV, HCV and HIV Infection

Hepatitis b virus (HBV) is a small prototype DNA virus of the Hepadnaviridae family with features similar to retroviruses. It is partially double-stranded and is classified into eight genotypes, A to H, with each having a distinct geographic distribution[1]. HBV is transmitted through contact with blood or other bodily fluids of an infected person, likewise through dirty needles from drug use as well as dirty needles from non-sterile tattoo shops. Three types of viral particles are visualized in infectious serum by electron microscopy and the infectious HBV virion known as the "Dane particle", consist of a lipid envelope containing hepatitis b surface antigen (HBsAg) that surrounds an inner nucleocapsid composed of hepatitis B core antigen (HBcAg) [1]. HBV attacks the liver and can cause both acute and chronic infections such as cirrhosis and hepatocellular carcinoma (HCC). HBV can persist in infected hepatocytes and has evolved elaborate strategies to evade the immune system, replicating via reverse transcription [2]. Drugs licensed for inhibition of HIV reverse transcriptase lower the viral load of chronic HBV patients, but they do not cure the infection. However, it can be prevented via currently available safe and effective vaccines which induces protective antibody levels in >95% of infants, children and young adults [3].

HCV on the other hand, is a small enveloped single-stranded RNA virus

belonging to the family Flaviviridae and genius hepacivirus, with six genotypes and more than 100 subtypes[4]. Very much like HIV, it is characterized by the continuous emergence of virus variants, thus making it a moving target for vaccine design. Despite the nucleotide sequence divergence among genotypes, all currently recognized HCV genotypes are hepatotropic and pathogenic[5]. HCV is blood borne and commonly transmitted through exposure to small quantities of blood such as in injection drug use, unsafe injection practices, unsafe healthcare, and the transfusion of unscreened blood and blood products. Like HBV, HCV can cause both acute and chronic infections in the liver. However, it has a higher propensity for chronicity resulting in higher risk for end stage liver disease progression to cirrhosis and HCC in infected persons[6]. Antiviral medicines can cure more than 95% of HCV infections but access to diagnosis and treatment is low [7]. Development of HCV vaccine is an obvious necessity; however there is currently no available vaccine.

HIV is a genetically related member of the Lentivirus genus of the Retroviridae family. It is currently grouped into two types, HIV-type 1 (HIV-1) and HIV-type 2 (HIV-2) with the worldwide main agent of AIDS being HIV-1, while HIV-2 is restricted to some regions of Western and Central Africa [8]. HIV targets and weakens the immune systems, making infected individuals gradually become immune-deficient and susceptible to infections and some types of cancer. Immune function is typically measured by CD4 cell count. The virus can be transmitted via the exchange of a variety of body fluids from infected

individuals, such as blood, breast milk, semen and vaginal secretions, and is often diagnosed through rapid diagnostic tests (RDTs) and other types of blood tests, which detect the presence or absence of HIV antibodies. There is no cure for HIV infection; however effective antiretroviral (ARV) drugs can control the virus and help prevent transmission so that people with HIV, and those at substantial risk, can enjoy healthy, long and productive lives [9].

1.2 Burden of HBV, HCV and HIV infections in Cameroon and the World.

In 2015, the global estimated burden of chronic infections with HBV and HCV was 257 and 71 million people respectively, while HIV also accounted for around 36.7 million cases of infected people with majority of them occurring in African countries [10-13]. However, in comparison with other major communicable diseases of international public health importance such as HIV, malaria and tuberculosis, whose mortality trends have been rapidly decreasing over the years due to effective prevention and control programs, trends in mortally due to HBV and HCV has been on the rise due to large neglect as a health and developmental priority until recent times, with mortality attributable to these two viral infections estimated at 1.4 million deaths per year (96% of all mortality from viral Hepatitis)[10, 11]. Furthermore, thanks to the global scale-up of ARV therapy, deaths due to HIV/AIDS-related causes decline from 1.9 million in 2005 to 1 million in 2016 [12].

Even though co-infections with two or more of these viruses vary greatly from one region to another and over time, globally, of the 36.7 million people affected with HIV in 2015, an estimated 2.7 million and 2.3 million people were co-infected with HBV and HCV respectively [10]. Also, another 7-20 million people were said to be co-infected with HBV and HCV, and approximately half a million co-infected with all three viruses, with these co-infections being relatively common in Africa including the regions of sub Saharan Africa where 68% of the world's HIV-infected people are found[14-19]. Each of these infections is a severe disease in itself with severity being greatly increased in persons harboring coinfections, causing cancers such as HCC, Kaposi sarcoma, Hodgkins and Non-Hodgkins lymphoma [20, 21]. Also, of the 750,000 liver cancer cases in 2015, 77% were attributable to HBV and HCV infections[22]. Furthermore, as HIV infected individuals have up to 33% higher chances of being co-infected with either HBV or HCV due to their suppressed immune status, prevention and monitoring effort on those infections and co-infections are in urgent need in this region [23, 24].

In Africa, HBV, HCV and HIV infections are said to be endemic, though their rates vary highly from one African country to another. Despite this endemic nature, most African countries still suffers from high rates of these viral infections and related chronic diseases due to lack of proper preventive strategies and poor accessibility to treatment, as a result of limited resources, less education, and lack of systematic monitoring on transmission [17, 25, 26]. Even though

47% of HIV positive eligible persons had access to antiretroviral therapy in sub-Saharan Africa in 2015, few people with viral hepatitis have been diagnosed (9% of HBV-infected persons and 20% of HCV-infected persons) due to poor access to affordable test in general population and even in blood donor [10, 27].

Cameroon, which is one of the countries in sub-Saharan Africa, has high endemicity for both HBV and HCV infections. Although there has been no national representative study on the prevalence of these two infections, sub-population studies including does among blood donors have shown consecutive increase in trends for both infections over the years [17, 18, 28-31]. According to two most recent systematic studies, the pooled prevalence was estimated at 11.2% and 6.5% for HBV and HCV infections respectively [32, 33]. On the other hand, although HIV infection still remains a prioritized problem in the country [34], thanks to public health efforts, its population prevalence had decreased from as high as 11% in 2000 [35], to 3.8%in 2016 [36].

1.3 Current state of HBV, HCV and HIV prevention in Cameroon and the world

As a means of achieving the 2030 Agenda for Sustainable Development which aims at eliminating viral hepatitis as well as HIV infections within this time frame as public health threats, the World Health Organization (WHO) released the first Global Health Sector Strategy (GHSS) on viral hepatitis and on HIV in June 2016 [11, 13]. These strategies outline both what countries need to

do and what WHO will do through five strategic fast-track actions, to be implemented in all countries against each of these viral infections. The GHSS on viral hepatitis focuses on HBV and HCV infections because these two account for 96% of all mortality from viral hepatitis. The first strategic direction stress on the importance of raising public awareness of these infections and the development of strong information system, with a target of achieving 30% and 90% reduction in new infections, and 10% and 65% reduction in viral hepatitis-related deaths by 2021 and 2030 respectively [11].

However, like most other sub-Saharan African countries where HIV has been predominant and concerned with great public health efforts, awareness and control of HBV and HCV infection have been in lack in Cameroon. There is no written national strategy or plan that focuses exclusively or primarily on the prevention and control of viral hepatitis, no designated governmental unit or department responsible solely for the coordination and carrying out of viral hepatitis related activities, and no funded public awareness campaign on viral hepatitis since 2011 [37].

HIV infection in this country is surveyed and controlled through a well-coordinated support program thanks to the partnership of the Cameroon government and international health organizations including CDC, UNAIDS, UNICEF, WHO, PEPFAR etc. The country has a frequently updated national guideline on the prevention and management of HIV with the most recent version being that of 2015 [38]. CDC provides technical leadership and direct assistance to the Ministry of Health and local non-governmental organizations (NGOs) to

strengthen epidemiology, surveillance, laboratory, operations research, HIV prevention, care and treatment programs, and workforce capacity development. They give special focus on prevention of mother-to-child HIV transmission (PMTCT), bloody safety, lab strengthening, linkages to treatment and care, and strategic information. In May 2016, the Minister of Health signed a Decision adopting the immediate implementation of the WHO [Test and Treat] strategy in the country with free, monthly distribution of ARV drugs to HIV infected persons in all public hospitals at the district and regional levels. Furthermore, national HIV surveys and statistics are frequently updated. That of 2016 showed that 63.2% of youths aged 15-24 years had adequate knowledge on prevention of HIV infection, and the total expenditure on HIV prevention and treatment was $64 million, 70% of which came from international funding [12].

As emphasized in the GHSS on viral hepatitis, raising awareness and knowledge of the general population regarding these infections is one of the corner stones in the fight against them. In Cameroon, this is particularly true for the population of blood donors since blood donation and transfusion has been suggested as one of the important route of transmission of these infections. Despite the high demand for blood and blood products in this country, previous studies have shown consecutively high prevalence of these infections among different populations of blood donors, with prevalence of HBV infection ranging from 6.8% in the study done by Dionne-Odom et al[28] to 16.9% in the study done by Loriette et al [39], and prevalence of HCV ranging from 1.3% in the study done by Moukoko et al[40] to 4.8% in the study done by Noubiap et al [18].

According to the ministry of health statistics, about 400,000 pints of blood are needed annually and blood is always in lack. A national blood transfusion program was created in 2013 but its activities have been in lack in most parts of the country. Due to that, blood collection and screening for transfusion is solely the responsibility of individual hospitals and there has been no system in place for follow-up and treatment of donors who tested positive for any of the infections after screening. According to the national algorithm for promotion of blood banks and blood availability which is implemented in most hospitals, for each pint of screened blood transfused to a patient, two replacement donors are requested from the patient's family. These replacement donors are often family members or friends who are interested in saving the life of their loved ones. In cases where there are no family members to donate blood, they have to look for potential donors within the community and pay them for this service. As a consequence, the majority of blood donors in Cameroon (at least 70%) are often family replacement donors while the remaining proportion includes those who are donating to receive payment from the patient's family and those who are donating voluntarily to know their health status. This counters the WHO recommendation for blood donation which recommend countries to recruit voluntary non-remunerated blood donors. Furthermore, replacement donors are not screened for infections before they donate their blood. Instead, they are bled in pints of 500cc and another 2ml in test tubes which are coded and stored in the blood banks and are then screened at a later time. Routine screening of donor blood for transfusion include screening for HIV, HBV, HCV and syphilis.

Donors are always requested to come back at a later time for their screening results. However, since most of them are family members who are often only interested in replacing blood used by their patients, only a few of them often return for their test results and this has been a neglected problem. Donors who return for results and are positive for HBV or HCV infection, are channeled to consult a doctor for medical advice and prescription of treatment while those who are positive for HIV are channeled to a counsellor for further confirmation and initiation of treatment. For this reason, the knowledge and awareness of these viral infections among blood donors and the entire population has been questionable and there is lack of studies in this area although they are essential in developing appropriate preventive strategies both at individual and population level.

1.4 Objectives

Overall, this study was designed to gain a better understanding of the knowledge and awareness of HBV, HCV compared to that of HIV among blood donors within the Kumba Health District, Southwest Region of Cameroon. As HBV and HCV are known to be avoidable risk factors for liver diseases and liver cancer development, this study also attempted to explain how the level of knowledge and awareness influenced the infection status of the study participants. It also tried to determine the rate of HBV vaccination uptake among the blood donor population. Finally, to generate findings to be used as guide for proposing

appropriate prevention and control strategies regarding the level of knowledge and awareness in a typical resource limited setting.

2. Methods

2.1 Study design and setting

A cross-sectional study was conducted among adult inhabitants who visited four major health facilities located within the Kumba Health District for blood donation. These facilities included; the District Hospital Kumba which is the 1st government referral hospital in Meme Division and has the biggest functional blood bank, the Presbyterian General Hospital Kumba, the Integrated Health Center Ntam, and St. John Catholic health center Fiango. Data collection began on the 15th of November 2017 and ended on the 15th of March 2018 in all of the study sites. The participating health facilities were selected from a broad range including; those which had an operational blood bank or previous statistics of high turnout rates of donors for blood donation, government and mission health facilities opened to the general public to target those who adhere to specific hospitals because of religious attachments.

This study was approved and granted administrative authorization to access health facilities within the Kumba health district by the Ethics committee of the Regional Delegation of Public Health for the Southwest Region, Cameroon. Participation was free and voluntary, and only donors who agreed to participate with verbal informed consent, after detailed and careful explanation of the entire study and its implications were enrolled.

2.2 Study population

Kumba is the headquarters of Meme Division in the South West region of Cameroon. It is a road junction town which had an estimated population of 400,000 inhabitants in 2015 and an annual growth rate of 4%, 3/4 of whom fall within the youthful age group [41]. It is known as the center for business as well as cocoa farming and palm oil production in the Southwest region because of its geographical location which allows easy import and export of business goods from and to neighboring Nigeria, and its characteristic rich soil respectively. This has led to a rapidly urbanizing settlement of the district, ranking it first in terms of population size in the Southwest region, with characteristics of multiple ethnicity, diverse cultural backgrounds and beliefs[42]. The Kumba Health District was carefully chosen as the study population because no study had ever been conducted among blood donors and the general populations in this area to evaluate the burden of HBV and HCV infections and the level of awareness and knowledge of these infections

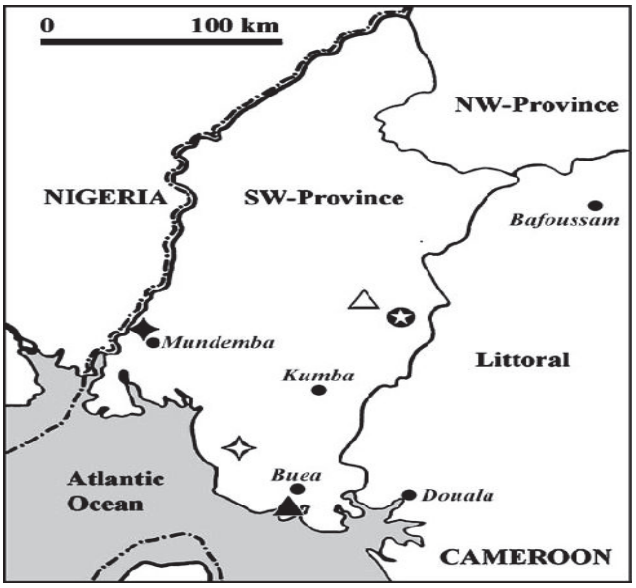

Figure 1: map of Cameroons south region showing geographical location of Kumba

among them. In this study, it was difficult to calculate an actual sample size that would perfectly present the knowledge and awareness of these infections in the population of blood donors because of the lack of previous studies on this subject. As such, we enrolled blood donors visiting these four hospital facilities in the Kumba District to get a reasonable sample size.

2.3 Questionnaire and Survey Procedure

A comprehensive and structured questionnaire was designed by reviewing literatures and adapting questions from previous knowledge and awareness studies on HBV, HCV and other infectious diseases. The questionnaire was pre-tested and then applied to obtain specific knowledge and awareness information on HBV, HCV and HIV infections, alongside demographic and other related health and risk behaviors information of the participants. Questionnaires were coded for each donor using the same serial number that was assigned to them in the blood donation units for the purpose of easy extraction of serologic results.

Screening of donors for infections was done by each blood donation unit separately and was not part of this study. Results of serologic tests of interest were only obtained from the registries of each unit at the end of the day and transferred to result section of questionnaires. However, in all units, HIV antibodies were detected by sequential testing of donor's serum using two rapid tests that detected both HIV-1 and HIV-2 infections: the Determine HIV-1/2

(Abbott Laboratories, USA) immuno-chromatographic assay test which had sensitivity and specificity of approximately 99.4% and 99.6% respectively; and the indirect solid-phase enzyme immunoassay ImmunoComb HIV 1&2 test (Orgenics, Courbevoie, France), which had a sensitivity of approximately 99.7% and a specificity of approximately 100%. Positive samples for both techniques were considered true positives; those negative for both techniques were considered true negatives; and those with discordant results were considered indeterminate. In our analysis, we excluded all discordant results. Furthermore, HBV infection was detected using a one-step immunoassay-based DIASpot HBsAg test strip (DIASpot Diagnostics, USA) which had sensitivity and specificity of 99% and 97.0% respectively and qualitatively detected HBsAg in serum. Finally, IgG antibodies against HCV were detected using an immuno-chromatographic based DIASpot HCV-Ab test strip (DIASpot Diagnostics, USA), which had an approximate 99.9% sensitivity and 98.6% specificity.

2.4 Measure

The survey included standard sociodemographic questions, questions on general healthy behavior assessment, questions on awareness as well as statements on knowledge of HBV, HCV and HIV, questions on history of risk behaviors, and finally results from serologic screening.

Sociodemographic characteristic measures included gender (male/female),

age (<30/30-39/≥40), place of residence, marital status, education level, most comprehensive language, occupation and family background.

To assess the general healthy behaviors of donors, a series of questions were asked relating to alcohol consumption, tobacco use status, ability to seek health information through various sources, infectious disease health education experience in community outreach or other programs, ability to seek routine health checkup, history of blood donation and motive for donating blood, and experience with sexual intercourse. Assessment of the history of risk behaviors of participants included questions on history of blood transfusion, history of previously treated sexually transmitted diseases, living with a family member or relative infected with any of the study infections, and HBV vaccination status.

For each of the three infections, awareness was ascertained by asking participants if they had ever heard of that infection and a "yes" was taken for being aware.

Knowledge was measured by asking the participants to answer six short True or False statements for each of the study infections and these were focused on mode of transmission, diagnosis, prevention and treatment of these infections. Only participants who indicated being aware of an infection was allowed to answer for the knowledge statements. Using the mean number of correct response of all participants, a quantitative method was used to categorize their knowledge level of each infection as relatively lower or relatively higher based

on whether they had between 0-3 and 4-6 correct Reponses.

2.5 Data analysis

Data were analyzed using STATA version 14.0. Descriptive statistics were used to calculate frequencies of responses for all sociodemographic characteristics, healthy behavior assessment and history of risk exposures, knowledge and awareness of HBV, HCV and HIV, as well as the prevalence of these infections among participants. Also, the differences between men and women were compared. Chi-square analysis was applied to describe the differences in knowledge and awareness and other characteristics of the participants. Multiple logistic regression analysis was applied to identify the predictors of HBV and HCV awareness and knowledge, as well as the predictors of a positive infection status of all three infections among male blood donors.

3. Results

3.1 General characteristics

A total of 730 blood donors were recruited in this study with a participation rate of approximately 100%. However, eighteen questionnaires were excluded due to incomplete donor information or due to indeterminate result for HIV infection status of some participants, leaving a total of 712 donors that were finally considered for analysis. Table 1 compares the distribution of major sociodemographic characteristics among men and women. The study population comprised of 619 male (86.9%) and 93 female (13.1%) in the age range of 17 to 68 years (mean age: 30 years). There was no significant difference by gender of participants with regard to age distribution, marital status, education level, residence, most comprehensive language and occupation and family background.

Table 1: Socio-Demographic Characteristics of study subject

	Total n= 712	Men n= 619(%)	Women n= 93(%)	*P* - value
Ages (years)				0.247
<30	352	301(48.6)	51(54.8)	
30-39	261	227(36.7)	34(36.6)	
≥40	99	91(14.7)	8(8.6)	
Marital Status				0.987
Single/Others	456	396(64.0)	60(64.5)	
Married	256	223(36.0)	33(35.5)	
Residence				0.694
Within Kumba City	592	516(83.4)	76(81.7)	
Outside Kumba City	120	103(16.6)	17(18.3)	
Education Attainment				0.757
≤Secondary school	198	172(27.8)	26(28.0)	
High School	332	286(46.2)	46(49.4)	
≥University	182	161(26.0)	21(22.6)	
Most Comprehensive Language				0.648
English/French	666	578(93.4)	88(94.6)	
"Pidgin" English/Dialect	46	41(6.6)	5(5.4)	
Occupation				0.063
Civil servants/Professionals	161	139(22.5)	22(23.7)	
Business	230	201(32.5)	29(31.2)	
Farmers	152	141(22.7)	11(11.8)	
Student	129	106(17.1)	23(24.7)	
Housewife/Unemployed	40	32(5.2)	8(8.6)	
Family Background				0.224
Monogamy	530	456(73.7)	74(79.6)	
Polygamy	182	163(26.3)	19(20.4)	

*Marital status (Others): Divorced/Widow/Widower
Residence (Outside Kumba City): Neighboring sub-towns/villages within Meme Division

3.2 General Healthy Behaviors

The distribution of responses related to questions on healthy behaviors that were practiced in normal daily live for both men and women are presented in table 2. From the analysis, a greater majority of women, 40.9% and 30.1%, either had no experience with alcoholic beverages or were occasional drinkers respectively, while men were more likely to consume these beverages, with 25.3% of them taking these drinks on three or more days per week. Also, men had more experience with cigarette smoking than women with prevalence of current smoking being 15.3% and 6.4% in men and women respectively. Majority of the current and former smokers for both genders said they had smoked for less than five years and were more likely to be moderate smokers, smoking between 6 and 10 sticks of cigarettes daily. Furthermore, there was a significant difference in health information-seeking behavior by gender, with women having a greater interest (72%) compare to men (60.8%) of men. However, men were more likely to explore the internet for health information while women were more likely to visit a doctor. Although greater than 75% of donors of both genders had experienced health education on one or more infectious diseases in community outreach or other health programs, only 2.8% and 6.5% of men and women respectively reported to have had education on viral hepatitis. HIV was the most frequently mentioned infection (49.6% of donors) to have been educated on during these programs. Other than blood donation, the rate of annual routine health checkup was low (18.7% of men and 45.2% of

women). Also, although men had more experience with blood donation than women, greater than 70% of donors for both genders were replacement donors. Lastly, experience on sexual activities was quite high among male and female donors, as 33.7% and 19.4% of them respectively reported to have had two or more sex partners in the last one year.

Table 2: General Healthy Behaviors

		Total n=712	Men n=619(%)	Women n=93(%)	*P* - value
Experience with alcoholic beverages per week					**<0.001**
Never		143	105(17.0)	38(40.9)	
Ever	Occasional	156	128(20.7)	28(30.1)	
	1-2 days	247	229(37.0)	18(19.3)	
	3-4 days	138	129(20.8)	9(9.7)	
	≥5 days	28	24(4.5)	0(0.0)	
Ever used any tobacco product					**0.037**
Never		565	482(77.8)	83(89.3)	
Ever	Current Smoker	100	94(15.3)	6(6.4)	
	Former smoker	47	43(6.9)	4(4.3)	
Smoking duration(years)					**0.066**
Never smoker		565	482(77.8)	83(89.3)	
Ever	≤5	74	68(11.0)	6(6.4)	
	6-10	38	37(6.0)	1(1.1)	
	≥11	35	32(5.2)	3(3.2)	
Average number of cigarettes smoked per day (sticks)					**0.042**
Never smoker		565	482(77.8)	83(89.3)	
Current/Former					
	≤5	38	34(5.5)	4(4.3)	
	6-10	77	71(11.5)	6(6.4)	
	≥11	32	32(5.2)	0(0.0)	
Health information seeking experience by channel used					**<0.001**
Never		269	243(39.2)	26(28.0)	
Ever	Internet exploring	204	185(29.9)	19(20.4)	
	Visit a doctor	152	126(20.4)	26(28.0)	
	Mass media	22	14(2.3)	8(8.6)	
	From surroundings	65	51(8.2)	14(15.0)	
Experience on infectious disease education in community					**0.210**
Never		165	144(23.3)	21(22.6)	
Ever	HIV	353	314(50.7)	39(41.9)	
	Malaria	61	51(8.2)	10(10.7)	
	Hepatitis	23	17(2.8)	6(6.5)	
	Others	110	93(15.0)	17(18.3)	
Experienced health checkup other than blood donation in the last 1 year					**<0.001**
Never		554	503(81.3)	51(54.8)	
Ever		158	116(18.7)	42(45.2)	

		Total n=712	Men n=619(%)	Women n=93(%)	*P* - value
Previous blood donation experience					**0.201**
Never		478	408(65.9)	70(75.3)	
Ever	1 time	112	101(16.3)	11(11.8)	
	≥2 times	122	110(17.8)	12(12.9)	
Last blood donation reason					**0.129**
Never		478	408(65.9)	70(75.3)	
Replacement		122	106(17.1)	16(17.2)	
For money		53	50(8.1)	3(3.2)	
Voluntary		59	55(8.9)	4(4.3)	
Current blood donation reason					**0.001**
Replacement		551	482(77.9)	69(74.2)	
For money		88	92(14.8)	7(7.5)	
Voluntary		62	45(7.3)	17(18.3)	
Experience on sexual intercourse in last 1 year					**0.045**
Never		81	70(11.3)	11(11.8)	
Ever	1 partner	404	340(54.9)	64(68.8)	
	≥2 partners	227	132(33.8)	11(19.3)	

*Mass media: TV health programs, Radio health programs
From surroundings: Family members, friends, neighbors, other relatives
Voluntary: To get tested and know health status

3.3 History of Risk Exposure or Prevention

Table 3 summarized the assessment of four questions related to history of risk exposure of participants to infectious diseases including HBV, HCV and HIV infections. It was determined that 4.7% o and 8.6% of male and female donors respectively had been transfused of blood in the past. Also, an average of 21.2% of male and female reported to have been treated of a sexually transmitted diseases in the past, with the highest being gonorrhea for men (11.8%) and chlamydia for women (6.4%). Furthermore, 18.4% of participants were either living with or had a family member suffering from one more of the study

infections with the most frequent being HIV (ma1e, 16.2%; female, 21.5%). HBV vaccination uptake was quite low among participants with a vaccination rate of 6.5% (male, 5.8%; female 10.8%).

Table 3: History of Risk Exposures

		Total n= 712	Men 619(%)	Women 93(%)	*P* - value
Ever received blood transfusion					**0.113**
Never		675	590(95.3)	85(91.4)	
Ever		37	129(4.7)	8(8.6)	
Ever contracted or been treated of any STD					**<0.001**
Never		568	496(80.1)	72(77.4)	
Ever	Gonorrhea	78	73(11.8)	5(5.3)	
	Chlamydia	31	25(4.0)	6(6.4)	
	Syphilis	28	24(3.9)	4(4.3)	
	Others	7	1(0.2)	6(6.4)	
Have a Family member currently suffering from any of the study infections					**0.511**
No		581	510(82.4)	71(73.3)	
Yes	HIV	120	100(16.2)	20(21.5)	
	HBV	10	8(1.3)	2(2.2)	
	HIV and HBV	1	1(0.2)	0(0.0)	
Ever received HBV vaccine					**0.071**
Never		666	583(94.2)	83(89.2)	
Ever		46	36(5.8)	10(10.8)	

*Others: Genital warts, Trichomonas, Mycoplasma

3.4 Awareness of HBV, HCV and HIV infections

Response related to self-reported awareness of all three infections in male and female participants were summarized and compared in table 4. Although blood donors tended to be more aware of HBV than HCV, the rate of awareness of both infections was quite low. Overall, 53.65% and 45.93% of donors were aware of HBV and HCV respectively, whereas it was 99.86% for HIV. There was

no significant difference in awareness of all three infections by gender.

Table 4: Awareness of HBV, HCV and HIV infections

	Total n= 712	**Men n= 619(%)**	**Women n= 93(%)**	***P* - value**
Ever heard about HBV				**0.639**
Never	330	289(46.7)	41(44.1)	
Ever	382	330(53.3)	52(55.9)	
Ever heard about HCV				**0.949**
Never	385	335(54.1)	50(53.8)	
Ever	327	284(45.9)	43(46.2)	
Ever heard about HIV				**0.698**
Never	1	1(0.2)	0(0.0)	
Ever	711	99(99.8)	93(100.0)	

3.5 Knowledge on HBV HCV and HIV infections

Only participants who reported being aware of any of the study infections were allowed to further answer for the knowledge-related statements of the said infection(s). The distributions of correct responses regarding the six statements for knowledge assessment of each infection are presented in figures 1, 2 and 3 respectively.

For HBV infection, at least four of the six statements were answered correctly by 48% of the participants, with the highest percentage being for the statement “HBV can be transmitted through unprotected sexual intercourse”, which was answered correctly by 52.7% of participants. Three HBV-related statements showed low correct response rate as less than 40% of participants provided correct answer for these statements. These included the statements; “HBV can be transmitted by eating contaminated seafood”, which was answered correctly by 38.4%; “Chronic HBV can be treated completely with antiviral

drugs", which was answered correctly by 37%; and "even when you take HBV vaccine, you still have to do regular diagnostic checkups to prevent HBV infection", which was answered correctly by 36.5%.

Similarly, for HCV infection, at least four of the six statements were answered correctly by 37.6% of participants, with the highest percentage being for the statement "HCV can be diagnosed through a blood screening test", which was answered correctly by 45.8% of participants. Also, two HCV-related statements showed very low correct response rate as less than 20% of participants provided correct answer for these statements. These were the statements; "HCV can be transmitted by exchange of saliva (kissing)", which was answered correctly 19.4% and "HCV carrier mother can infect her baby during breastfeeding", which was answered correctly by 17.8% of participants.

In contrast to HBV and HCV-related statements for which just barely average of participants had four or more correct answers, 99.2% of these participants had at least four correct answers for HIV-related statements. Apart from the statement "HIV positive women on antiretroviral therapy can breastfeed" which was answered correctly by 76.8% of participants, all the other HIV-related statements were answered correctly by above 95% of participants.

Table 5: Statements of HBV-related knowledge

Statements
1. HBV can be transmitted by eating contaminated seafood
2. HBV carrier mother can infect her baby during delivery
3. HBV can be transmitted through unprotected sexual intercourse
4. More than 95% of HBV can be protected through vaccination
5. Chronic HBV can be treated completely with antiviral drugs
6. Even when you take HBV vaccine, you still have to do regular diagnostic checkups to prevent HBV infection

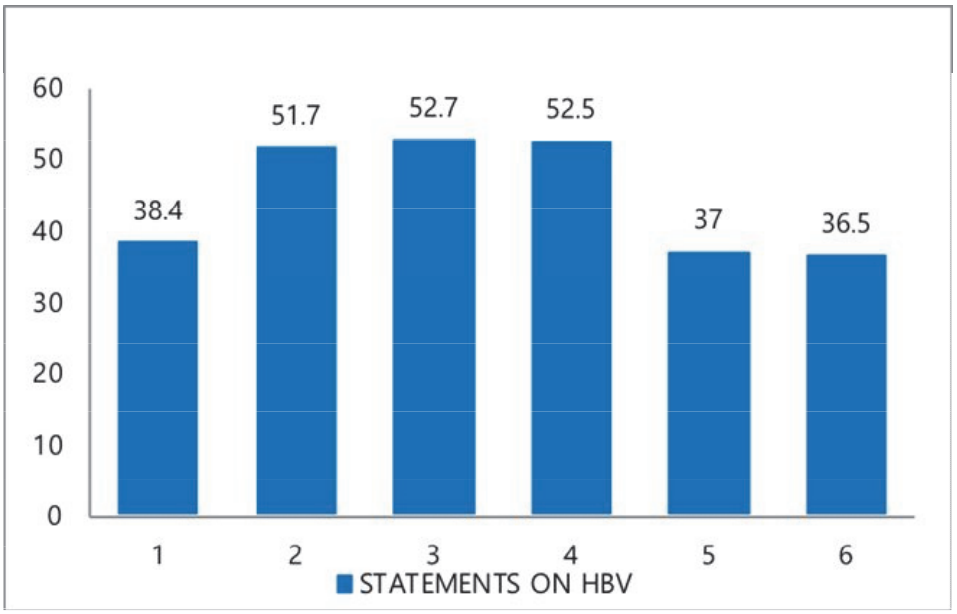

Figure 2: the percentage of participants who answered correctly to each HBV-related statement.

Table 6: Statements of HCV-related knowledge

Statements
1. HCV can be transmitted by exchange of saliva (kissing)
2. HCV can be transmitted by blood transfusion
3. HCV carrier mother can infect her baby during breastfeeding
4. HCV can be prevented by HCV vaccination
5. Treatment for HCV is cheap and easy to get
6. HCV can be diagnosed through a blood screening test

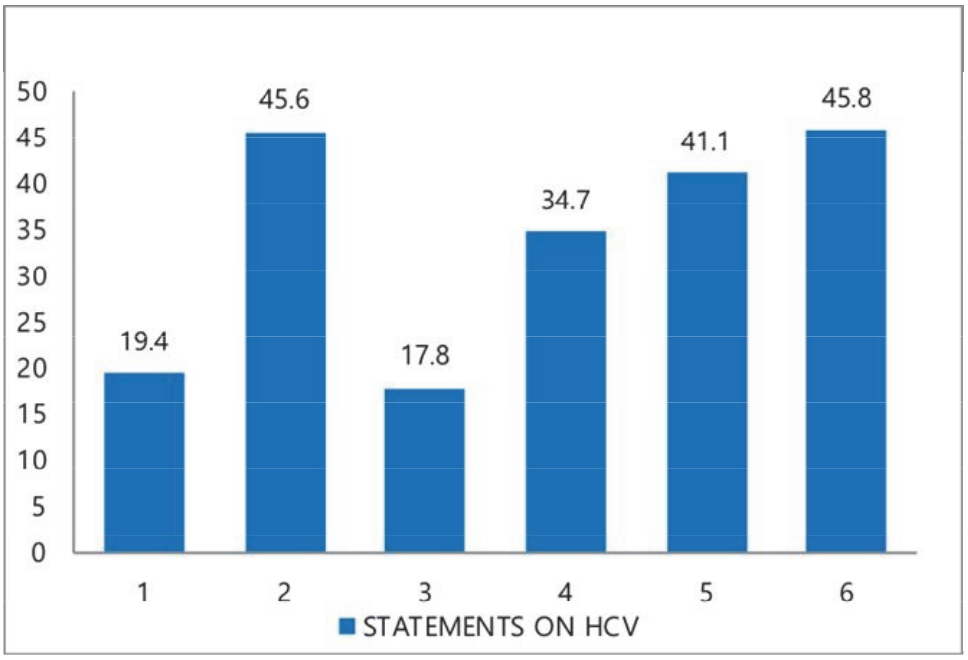

Figure 3: the percentage of participants who answered correctly to each HCV-related statement.

Table 7: Statements of HIV-related Knowledge

Statements
1. HIV can be transmitted by body piercing (tattooing)
2. Unprotected sexual intercourse can transmit HIV together with HBV and/or HCV at the same time
3. HIV positive women on antiretroviral therapy can breastfeed
4. HIV can be diagnosed by blood screening test
5. HIV can be prevented by HIV vaccination
6. Anti-retroviral drugs can completely treat HIV infection

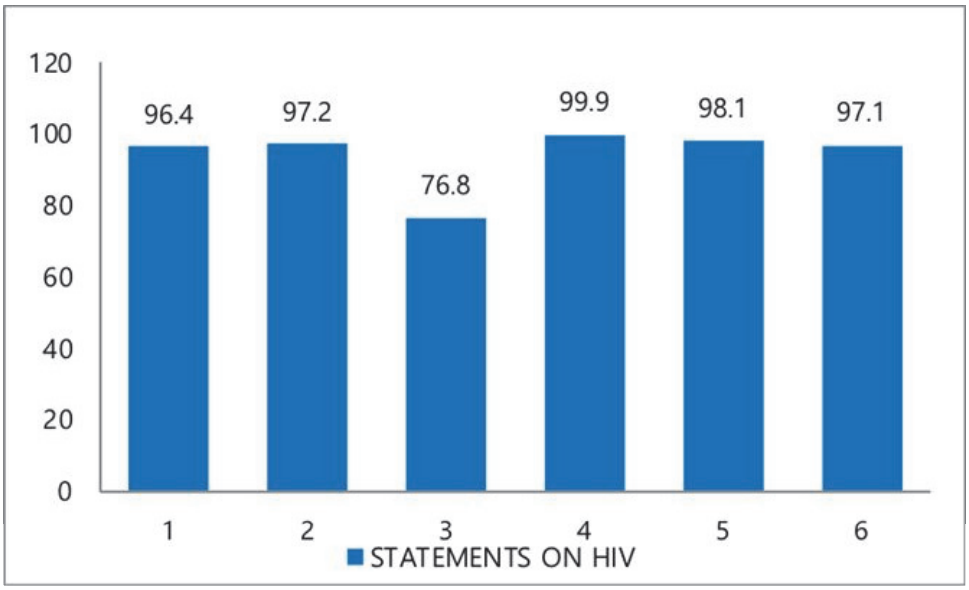

Figure 4: the percentage of participants who answered correctly to each HIV-related statement.

3.6 Prevalence of HBV, HCV and HIV Infections

In this study, the overall prevalence of HBV, HCV and HIV infections among blood donors was 12.8%, 4.6% and 6.6% respectively (Table 6). All the three infections had relatively higher prevalence in men than in women. The most frequent cases of coinfections were observed between HIV and HBV (12 cases, 1.7%). Prevalence of coinfections between HIV and HCV was 0.7% (5 cases) while for HBV and HCV, it was 0.3% (2 cases). However, there were no cases of coinfection with all three infections.

By the current motivation for blood donation, family replacement donors showed the highest prevalence for all three infections, 13.6%, 5.3% and 7.1% for HBV, HCV and HIV respectively. Similarly, voluntary donors showed the least prevalence for all three donors, 8.1%, 0.0% and 4.0% for HBV, HCV and HIV respectively. Donors donating for money showed just a little lower prevalence of all three infections compared to replacement donors, as they had prevalence of 11.1%, 4.0% and 6.4% for HBV, HCV and HIV respectively.

Among the 46 participants who reported to have been vaccinated against HBV, 1participant (2.2%) tested positive for HBV infection. However, we could not ascertain whether all the vaccinated donors completed the required three doses of HBV vaccine for full immunization.

Table 8: Prevalence of positive cases in serologic test results

	Overall n=712(%)	Male n=619(%)	Female n=93(%)
HBV	91(12.8)	83(13.4)	8(8.6)
HCV	33(4.6)	30(4.9)	3(3.2)
HIV	47(6.6)	42(6.8)	5(5.4)
HIV/HBV	12(1.7)	11(1.8)	1(1.1)
HIV/HCV	5(0.7)	5(0.8)	0(0.0)
HBV/HCV	2(0.3)	2(0.3)	0(0.0)
HIV/HBV/HCV	0(0.0)	0(0.0)	0(0.0)

3.7 General Characteristics by the Level of HBV and HCV-Related Awareness

Since more than 95% of donors reported being aware of HIV infection, comparison of the differences in distribution of study characteristics by self-reported awareness was focused for HBV and HCV infections only. Table 7 compares the distribution of major characteristics and infection status for all three infections among participants who were aware of HBV and HCV. In this study, all donors who reported being aware of HCV also reported being aware of HBV infection. Awareness of both HBV and HCV infections were significantly associated with marital status, residential area, education level, most comprehensive language, occupation, health information-seeking behavior, infectious disease education experience, blood donation experience and motivation, number of sex partners, HBV vaccination status, HBV infection status and HIV infection status. Also, only 69.7% and 58.2% of donors who had

previous blood donation experience of two times or more were aware of HBV and HCV infections respectively. We found this to be attributed to the fact that there was neither any written document nor standard operating procedure in any of the blood donation units, used for counseling and informing donors of the various test that were conducted on their blood during screening for transfusion. Passing out this information was at the discretion of the lab personnel in charge of bleeding donors and they often neglect or forget especially when there were many donors to be bled.

Table 9: Distribution of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status by HBV and HCV awareness

Selected Variables	Total n=712	Aware of HBV		Aware of HCV	
		382(%)	*P* - value	327(%)	*P* - value
Gender			**0.639**		**0.949**
Male	619	330(53.3)		284(45.9)	
Female	93	52(55.9)		43(46.2)	
Ages			**0.111**		**0.081**
<30	352	175(49.7)		148(45.0)	
30-39	261	149(57.1)		126(48.3)	
≥40	99	58(58.6)		53(53.5)	
Marital Status			**0.009**		**0.006**
Single/Others	456	228(50.0)		192(42.1)	
Married	256	154(60.2)		135(52.7)	
Residential Area			**<0.001**		**<0.001**
Within Kumba City	592	337(56.9)		293(49.5)	
Outside Kumba City	120	45(37.5)		34(28.3)	
Education Attainment			**<0.001**		**<0.001**
≤Secondary	198	45(22.7)		31(15.7)	
High School	332	170(51.2)		133(40.1)	
≥University	182	167(91.8)		163(89.6)	
Most Comprehensive Language			**0.001**		**<0.001**
English/French	666	368(55.3)		318(47.6)	
"Pidgin" English/Dialect	46	14(30.4)		9(19.6)	
Occupation			**<0.001**		**<0.001**
Civil servants/professionals	161	118(73.3)		114(70.8)	
Business	230	130(56.5)		111(48.3)	
Farming	152	45(29.6)		32(21.0)	
Student	129	58(45.0)		46(46.0)	
Housewife/Unemployed	40	31(77.5)		24(60.0)	
Family Background			**0.252**		**0.098**
Monogamy	530	291(54.9)		253(47.7)	
Polygamy	182	91(50.0)		74(40.7)	
Health information seeking experience by channel used			**<0.001**		**<0.001**
Never	269	100(37.2)		75(27.9)	
Internet	204	140(68.6)		129(63.2)	
Visit a Doctor	152	107(70.4)		98(64.5)	
Mass Media	22	12(54.6)		8(36.4)	
From Surroundings	65	23(35.4)		17(26.1)	

Selected Variables	Total n=712	Aware of HBV		Aware of HCV	
		382(%)	*P* - value	327(%)	*P* - value
Previous infectious disease education experience			**<0.001**		**<0.001**
Never	165	65(39.4)		55(33.3)	
HIV	353	178(50.4)		152(43.1)	
Malaria	61	37(66.7)		33(54.1)	
Hepatitis	23	22(95.7)		18(78.3)	
Others	110	80(72.7)		69(62.7)	
Previous blood donation experience			**<0.001**		**<0.001**
Never	478	222(46.4)		192(40.2)	
1 time	112	75(67.0)		64(57.1)	
≥2 times	122	85(69.7)		71(58.2)	
Current blood donation reason			**<0.001**		**<0.001**
Replacement	551	273(49.5)		232(42.1)	
For Money	99	61(61.6)		52(52.5)	
Voluntary	62	48(77.4)		43(69.4)	
Number of sex partners in last 1 year			**0.005**		**0.004**
None	81	33(40.7)		29(35.8)	
1 partner	404	236(58.4)		207(51.2)	
≥ 2 partners	227	113(49.8)		91(40.1)	
Ever contracted/been treated of any STD			**0.122**		**0.023**
Never	568	313(55.1)		273(48.1)	
Ever	144	69(47.9)		54(37.5)	
Ever received blood transfusion			**0.286**		**0.175**
Never	675	359(53.2)		306(45.3)	
Ever	37	23(62.2)		21(56.8)	
Ever received HBV Vaccine			**<0.001**		**<0.001**
Never	666	338(50.7)		285(42.8)	
Ever	46	44(95.7)		42(91.3)	
HBV infection status			**0.001**		**0.002**
Negative	621	348(56.0)		299(48.2)	
Positive	91	34(37.4)		28(30.8)	
HCV infection status			**0.542**		**0.956**
Negative	679	366(53.9)		312(46.0)	
Positive	33	16(48.5)		15(45.4)	
HIV infection status			**0.002**		**0.001**
Negative	665	367(55.2)		316(47.5)	
Positive	47	15(31.9)		11(23.4)	

*Marital status (Others): Divorced/Widow/Widower.

From surroundings: Family members, friends, neighbors, other relatives.

Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

*All those who reported being aware of HCV was aware of HBV.

3.8 General characteristics by the level of HBV and HCV-related Knowledge.

Similarly, for the comparison of the differences in distribution of study characteristics and infection status by Knowledge level, only HBV and HCV infections were considered as more than 95% of participants had relatively higher knowledge on HIV. These distributions are presented on tables 10 and 11 for HBV and for HCV infections respectively. Level of HBV-related knowledge was significantly associated with marital status, residential area, education level, most comprehensive language, occupation, health information-seeking behavior, infectious disease education experience, blood donation experience and motivation, number of sex partners, HBV vaccination status, HBV infection status and HIV infection status. Similar significance plus an additional for previously treated STD were seen for level of HCV-related knowledge.

Table 10: Distribution of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status by HBV-related Knowledge

Selected Variables	Total n=712	Relative higher HBV Knowledge n(%)	*P* – value
Gender			**0.767**
Male	619	296(47.8)	
Female	93	46(49.5)	
Ages (years)			**0.187**
<30	352	157(44.6)	
30-39	261	133(51.0)	
≥40	99	52(52.5)	
Marital Status			**0.008**
Single/Others	456	202(44.3)	
Married	256	140(54.7)	
Residential Area			**<0.001**
Within Kumba City	592	305(51.2)	
Outside Kumba City	120	37(30.8)	
Education Attainment			**<0.001**
≤Secondary School	198	32(16.2)	
High School	332	149(44.9)	
≥University	182	161(88.5)	
Most Comprehensive Language			**<0.001**
English/French	666	332(49.9)	
"Pidgin" English/Dialect	46	10(21.7)	
Occupation			**<0.001**
Civil servant/Professionals	161	107(66.5)	
Business	230	117(50.9)	
Farming	152	37(24.3)	
Student	129	53(41.1)	
Housewife/Unemployed	40	28(70.0)	
Family background			**0.148**
Monogamy	530	263(49.6)	
Polygamy	182	79(43.4)	
Health information seeking experience by channel used			**<0.001**
Never	269	80(29.7)	
Internet	204	132(64.7)	
Visit a Doctor	152	99(65.1)	
Mass Media	22	10(45.4)	
From surroundings	65	21(32.3)	

Selected Variables	Total n=712	Relative higher HBV Knowledge n(%)	*P* – value
Previous infectious disease education experience			**<0.001**
Never	165	56(33.9)	
HIV	353	163(46.2)	
Malaria	61	32(52.5)	
Hepatitis	23	19(82.6)	
Others	110	72(65.4)	
Previous blood donation experience			**<0.001**
Never	478	200(41.8)	
1 time	112	66(58.9)	
≥2 times	122	76(62.3)	
Current blood donation reason			**0.002**
Replacement	551	247(44.8)	
For Money	99	54(54.6)	
Voluntary	62	41(66.1)	
Number of sex partners in last 1 year			**0.007**
None	81	33(40.7)	
1 partner	404	234(57.9)	
≥2 partners	227	112(49.2)	
Ever contracted/been treated of any STD			**0.106**
Never	568	311(54.7)	
Ever	144	68(47.2)	
Ever received blood transfusion			**0.263**
Never	675	356(52.7)	
Ever	37	23(62.2)	
Ever received HBV vaccine			**<0.001**
Never	666	335(50.3)	
Ever	46	44(95.7)	
HBV infection status			**0.002**
Negative	621	312(50.2)	
Positive	91	30(33.0)	
HCV infection status			**0.761**
Negative	679	327(48.2)	
Positive	33	16(45.4)	
HIV infection status			**0.001**
Negative	665	330(49.6)	
Positive	47	12(25.3)	

*Marital status (Others): Divorced/Widow/Widower

Residence (Outside Kumba City): Neighboring sub-towns/villages to Kumba

From surroundings: Family members, friends, neighbors, other relatives

Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

Table 11: Distribution of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status by HCV-related Knowledge

Selected Variables	Total n=712	Relative higher HCV Knowledge n(%)	*P* - value
Gender			**0.251**
Male	619	238(38.4)	
Female	93	30(32.3)	
Ages (years)			**0.204**
<30	352	121(34.4)	
31-39	261	106(40.6)	
≥40	99	41(41.4)	
Marital Status			**0.002**
Single/Others	456	152(33.3)	
Married	256	116(45.3)	
Residential Area			**<0.001**
Within Kumba City	592	242(40.9)	
Outside Kumba City	120	26(21.7)	
Education Attainment			**<0.001**
≤Secondary School	198	17(8.6)	
High School	332	103(31.0)	
≥University	182	148(81.3)	
Most Comprehensive Language			**<0.001**
English/French	666	263(39.5)	
"Pidgin" English/Dialect	46	5(10.9)	
Occupation			**<0.001**
Civil servant/Professionals	161	95(59.0)	
Business	230	95(41.3)	
Farming	152	23(15.1)	
Student	129	35(27.1)	
Housewife/Unemployed	40	20(50.0)	
Family background			**0.329**
Monogamy	530	205(38.7)	
Polygamy	182	63(34.6)	
Health information seeking experience by channel used			**<0.001**
Never	269	60(22.3)	
Internet	204	112(54.9)	
Visit a Doctor	152	82(54.0)	
Mass Media	22	2(9.1)	
From surroundings	65	12(18.5)	

Selected Variables	Total n=712	Relative higher HCV Knowledge n(%)	*P* - value
Previous infectious disease education experience			**0.001**
Never	165	48(29.1)	
HIV	353	124(35.1)	
Malaria	61	27(44.3)	
Hepatitis	23	14(60.9)	
Others	110	55(50.0)	
Previous blood donation experience			**<0.001**
Never	478	154(32.2)	
1 time	112	56(50.0)	
≥2 times	122	58(47.5)	
Current blood donation reason			**0.008**
Replacement	551	192(34.8)	
For Money	99	43(43.4)	
Voluntary	62	33(53.2)	
Number of sex partners in last 1 year			**0.001**
None	81	28(34.6)	
1 partner	404	203(50.3)	
≥ partners	227	83(36.6)	
Ever contracted/been treated of any STD			**0.004**
Never	568	266(46.8)	
Ever	144	48(33.3)	
Ever received blood transfusion			**0.362**
Never	675	295(43.7)	
Ever	37	19(51.4)	
Ever received HBV vaccine			**<0.001**
Never	666	275(41.3)	
Ever	46	39(84.8)	
HBV infection status			**0.002**
Negative	621	247(39.8)	
Positive	91	21(23.1)	
HCV infection status			**0.877**
Negative	679	256(37.7)	
Positive	33	12(36.4)	
HIV infection status			**0.007**
Negative	665	259(39.0)	
Positive	47	9(19.1)	

*Marital status (Others): Divorced/Widow/Widower.

Residence (Outside Kumba City): Neighboring sub-towns/villages to Kumba.

From surroundings: Family members, friends, neighbors, other relatives.

Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola

3.9 Factors associated with awareness of HBV and HCV among male blood donors.

Tables 12 and 13 present the predictors of HBV and HCV infections awareness respectively, among male participants. Because of the very small proportion of female donor participants, only the characteristic predictors in male blood donors were studied. Also, the backward stepwise approach was used to select the best predictor variables for the logistic regression model of HBV and HCV infection awareness, knowledge and infection status.

While controlling for potential confounders, education level (high school: OR=4.46, 95% CI=2.64, 7.56; ≥University: OR=38.75, 95% CI=17.34, 86.71), health information-seeking behavior (OR=3.05, 95% CI=1.01, 2.24), HBV vaccination status (OR=5.05, 95% CI=1.11, 23.01), experience on infectious disease education (hepatitis: OR=27.5, 95% CI=2.99, 205.94; others: OR=2.77, 95% CI=1.29, 5.97) and experience in blood donation (≥2times OR=2.24, 95% CI=1.26, 3.97) were the significant correlates for male participants who reported being aware of HBV infection. For male donors who reported being aware of HCV infection, significant correlates were also found for education level (high school: OR=4.34, 95% CI=2.45, 7.66; ≥University: OR=47.08, 95% CI=21.28, 104.18), health information seeking behavior (OR=1.60, 95% CI=1.03, 2.48), HBV vaccination status (OR=4.86, 95% CI=1.33, 17.44), and experience in blood donation (≥2times: OR=1.78, 95% CI=1.03, 3.18).

Table 12: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status in male subjects who reported being aware of HBV infection.

Variables	Total n=619	Aware of HBV n=330(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
<30	301	148(49.2)	Ref	Ref
30-39	227	131(57.7)	**1.41[1.00-1.99]**	1.23[0.75-2.02]
≥40	91	51(56.0)	1.32[0.82-2.11]	1.21[0.59-2.46]
Education Attainment				
≤Secondary	172	34(10.3)	Ref	Ref
High School	286	147(44.5)	**4.55[2.89-7.16]**	**4.46[2.64-7.56]**
≥University	161	149(45.2)	**53.57[26.49-108.34]**	**38.75[17.34-86.71]**
Occupation				
Farming	141	41(29.1)	Ref	Ref
Student	106	46(43.4)	**2.25[1.25-4.04]**	0.89[0.42-1.87]
Business	201	119(59.2)	**3.63[2.28-5.79]**	1.34[0.76-2.36]
Civil servants/ professionals	139	99(71.2)	**5.83[3.47-9.81]**	1.14[0.58-2.22]
Unemployed	32	25(78.1)	**10.20[3.98-26.15]**	2.92[0.91-9.31]
Health information seeking experience				
Never	243	89(36.6)	Ref	Ref
Ever	376	241(64.1)	**3.05[2.18-4.27]**	**1.47[1.01-2.24]**
Have received HBV vaccination				
Never	583	296(50.8)	Ref	Ref
Ever	36	34(94.4)	**15.98[3.80-67.22]**	**5.05[1.11-23.01]**
Infectious disease education experience in outreach programs				
Never	144	56(38.9)	Ref	Ref
HIV	314	156(49.7)	**1.53[1.02-2.30]**	1.43[0.85-2.41]
Malaria	51	30(58.2)	**2.15[1.12-4.14]**	1.31[0.56-2.99]
Hepatitis	17	16(94.1)	**24.70[3.18-191.94]**	**27.50[2.99-205.94]**
Others	93	72(77.4)	**5.19[2.87-9.40]**	**2.77[1.29-5.97]**
Previous blood donation experience				
Never	408	191(46.8)	Ref	Ref
1 time	101	66(65.4)	**2.06[1.30-3.26]**	1.30[0.73-2.32]
≥2 times	110	73(66.4)	**2.18[1.38-3.45]**	**2.24[1.26-3.97]**
HBV infection status				
Positive	83	32(38.5)	Ref	Ref
Negative	536	298(55.6)	**1.18[1.22-3.17]**	1.18[0.65-2.15]

OR =odds ratio; Ref = reference; [a] Adjustment for age; [b] Multiple logistic regression model
Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

Table 13: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status in male subjects who reported being aware of HCV infection.

Variables	Total n=619	Aware of HCV n=284(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
<30	301	124(41.2)	Ref	Ref
31-39	227	114(50.2)	**1.44[1.02-2.04]**	1.19[0.72-1.96]
≥40	91	46(50.6)	1.46[0.91-2.34]	1.15[0.55-2.41]
Education Attainment				
≤Secondary	172	22(7.8)	Ref	Ref
High School	286	116(40.8)	**5.00[2.98-8.41]**	**4.34[2.45-7.66]**
≥University	161	146(51.4)	**72.18[35.67-146.06]**	**47.08[21.28-104.18]**
Occupation				
Farming	141	28(19.9)	Ref	Ref
Student	106	37(34.9)	**2.51[1.33-4.71]**	0.77[0.35-1.71]
Business	201	102(50.7)	**4.25[2.57-7.03]**	1.53[0.85-2.78]
Civil servants/ professionals	139	97(69.8)	**9.06[5.21-15.74]**	1.85[0.93-3.69]
Unemployed	32	20(62.5)	**7.62[3.23-17.98]**	1.55[0.51-4.68]
Health information seeking experience				
Never	243	69(28.4)	Ref	Ref
Ever	376	215(57.2)	**3.31[2.33-4.68]**	**1.60[1.03-2.48]**
Have received HBV vaccination				
Never	583	251(43.0)	Ref	
Ever	36	33(91.7)	**14.14[4.28-46.71]**	**4.86[1.33-17.44]**
Infectious disease education experience in outreach programs				
Never	144	49(17.3)	Ref	Ref
HIV	314	135(47.5)	1.45[0.95-2.19]	1.29[0.74-2.24]
Malaria	51	27(9.5)	**2.06[1.07-3.96]**	1.16[0.48-2.81]
Hepatitis	17	12(4.2)	**4.58[1.52-13.86]**	3.02[0.71-12.86]
Others	93	61(21.5)	**3.54[2.03-6.16]**	1.36[0.63-2.90]
Previous blood donation experience				
Never	408	165(58.1)	Ref	Ref
1 time	101	56(19.7)	**1.73[1.11-2.71]**	1.01[0.57-1.81]
≥2 times	110	63(22.2)	**1.86[1.19-2.89]**	**1.78[1.03-3.18]**
HCV infection status				
Positive	30	13(4.6)	Ref	Ref
Negative	589	271(95.4)	1.17[0.55-2.46]	0.66[0.26-1.65]

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

3.10 Factors associated with Knowledge of HBV and HCV among male blood donors.

The predictors of HBV and HCV infection-related knowledge among male participants in this study are presented in tables 14 and 15 respectively. After controlling for potential confounders, education level (high school: OR=5.19, 95% CI=2.94, 9.17; ≥University: OR=41.49, 95% CI=19.10, 90.11), Occupation (Unemployed: OR=3.15, 95% CI=1.01, 9.78), health information-seeking behavior (OR=1.74, 95% CI=1.14, 2.65), HBV vaccination status (OR=2.21, 95% CI=1.08, 6.47), experience on infectious disease education (hepatitis: OR=7.53, 95% CI=1.57, 36.17) and experience in blood donation (≥2times OR=2.03, 95% CI=1.16, 3.55) were the significant correlates for male participants who had relatively knowledge of HBV infection.

For male donors who had relatively higher knowledge on HCV infection, significant correlates were found for education level (high school: OR=5.88, 95% CI=2.89, 11.95; ≥University: OR=63.36, 95% CI=26.98, 148.75), health information seeking behavior (OR=1.36, 95% CI=1.06, 2.17), experience on infectious disease education (hepatitis: OR=1.34, 95% CI=1.08, 3.92) HBV vaccination status (OR=4.27, 95% CI=1.44, 12.64), and experience in blood donation (≥2times: OR=1.80, 95% CI=1.02, 3.23).

Table 14: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status in male subjects with relatively higher knowledge on HBV infection

Variables	Total n=619	Higher HBV knowledge n=296(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
<30	301	133(44.2)	Ref	Ref
30-39	227	118(52.0)	1.37[0.97-1.93]	1.33[0.81-2.18]
≥40	91	45(49.4)	1.23[0.77-1.98]	1.27[0.63-2.58]
Education Attainment				
≤Secondary	172	24(13.9)	Ref	Ref
High School	286	129(45.1)	**5.27[3.20-8.68]**	**5.19[2.94-9.17]**
≥University	161	143(88.8)	**51.56[26.68-99.64]**	**41.49[19.10-90.11]**
Occupation				
Farming	141	34(24.1)	Ref	Ref
Student	106	42(39.6)	**2.49[1.36-4.57]**	0.89[0.41-1.89]
Business	201	107(53.2)	**3.67[2.27-5.94]**	1.32[0.74-2.37]
Civil servants/ professionals	139	89(64.0)	**5.42[3.21-9.12]**	1.08[0.47-1.84]
Unemployed	32	24(75.0)	**11.08[4.42-27.75]**	**3.15[1.01-9.79]**
Health information seeking experience				
Never	243	73(30.0)	Ref	Ref
Ever	376	223(59.3)	**3.36[2.38-4.75]**	**1.74[1.14-2.65]**
Infectious disease education experience in outreach programs				
Never	144	51(35.4)	Ref	Ref
HIV	314	142(45.2)	1.48[0.98-2.34]	1.37[0.81-2.32]
Malaria	51	25(49.0)	1.69[0.87-3.23]	0.86[0.37-1.99]
Hepatitis	17	14(82.3)	**8.33[2.28-30.46]**	**7.53[1.57-36.17]**
Others	93	64(68.8)	**3.89[2.22-6.80]**	1.78[0.85-3.73]
Previous blood donation experience				
Never	408	172(42.2)	Ref	Ref
1 time	101	59(58.4)	**1.86[1.18-2.91]**	1.16[0.66-2.05]
≥2 times	110	65(59.1)	**1.95[1.25-3.04]**	**2.03[1.16-3.55]**
Have received HBV vaccination				
Never	538	265(45.4)	Ref	Ref
Ever	36	31(86.1)	**7.22[2.76-18.86]**	**2.21[1.08-6.47]**
HBV infection status				
Positive	83	28(33.7)	Ref	Ref
Negative	536	268(50.0)	**1.94[1.19-3.16]**	1.11[0.60-2.03]

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

Table 15: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and infection status in male subjects with relatively higher knowledge on HCV infection

Variables	Total n=619	Higher HCV Knowledge n=238(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
<30	301	106(35.2)	Ref	Ref
31-39	227	95(41.8)	1.32[0.93-1.89]	1.06[0.63-1.78]
≥40	91	37(40.7)	1.26[0.78-2.04]	0.84[0.39-1.81]
Education Attainment				
≤Secondary	172	11(6.4)	Ref	Ref
High School	286	91(31.8)	**7.00[3.60-13.64]**	**5.88[2.89-11.95]**
≥University	161	136(84.5)	**83.73[39.53-177.34]**	**63.36[26.98-148.75]**
Occupation				
Farming	141	19(13.5)	Ref	Ref
Student	106	31(29.2)	**2.84[1.43-5.67]**	0.65[0.28-1.53]
Business	201	88(43.8)	**5.02[2.86-8.80]**	1.54[0.80-2.97]
Civil servants/ professionals	139	83(59.7)	**9.40[5.19-17.02]**	1.52[0.72-3.22]
Unemployed	32	17(53.1)	**7.69[3.21-18.46]**	1.32[0.43-4.05]
Health information seeking experience				
Never	243	57(23.5)	Ref	Ref
Ever	376	181(48.1)	**3.00[2.09-4.30]**	**1.36[1.06-2.17]**
Infectious disease education experience in outreach programs				
Never	144	45(31.2)	Ref	Ref
HIV	314	112(35.7)	1.20[0.78-1.83]	1.08[0.55-1.73]
Malaria	51	22(43.1)	1.61[0.83-3.11]	1.12[0.46-1.83]
Hepatitis	17	9(52.9)	**2.41[1.43-6.69]**	**1.34[1.08-3.92]**
Others	93	50(53.8)	**2.47[1.43-4.24]**	1.10[0.45-1.60]
Previous blood donation experience				
Never	408	135(33.1)	Ref	Ref
1 time	101	51(50.5)	**2.00[1.27-3.14]**	1.34[0.75-2.38]
≥2 times	110	52(47.3)	**1.77[1.14-2.76]**	**1.80[1.02-3.23]**
Have received HBV vaccination				
Never	583	207(35.5)	Ref	ref
Ever	36	31(86.1)	**11.00[4.21-28.77]**	**4.27[1.44-12.64]**
HCV infection status				
Positive	30	10(33.3)	Ref	Ref
Negative	589	228(38.7)	1.31[0.60-2.86]	0.71[0.27-1.89]

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

3.11 Factors associated with HBV and HCV infection status among male blood donors.

In this study, the predictors of HBV, HCV and HIV infection status among male participants were assessed and are presented in tables 16 and 17 and 18 respectively. While controlling for potential confounders, education level (≥University: OR=0.20, 95% CI=0.08, 0.63), health information-seeking behavior (OR=1.37, 95% CI=1.06, 2.38), number of sex partners in last one year (1 partner: OR=7.71, 95% CI=1.68, 35.65; ≥2 partners: OR=21.35, 95% CI=4.64, 98.33) were significantly associated with a positive HBV infection status. Also, although association of HBV infection status with awareness, knowledge could not be observed in multivariate analysis, it was significant for awareness (OR=1.97, 95% CI=1.22, 3.17) and knowledge (OR=1.92, 95% CI=1.19, 3.09) when age was adjusted.

For positive HCV infection status, statistically significant variables identified included experience on infectious disease education (malaria: OR=4.63, 95% CI=1.23, 17.35), number of sex partners in last one year (1 partner: OR=5.68, 95% CI=2.20, 23.22; ≥2 partners: OR=12.96, 95% CI=2.88, 60.18). Furthermore, there were no positive cases of HCV infection among male donors with education experience on hepatitis and those who were unemployed. When compared in Chi square analysis, 84.4% of unemployed male donors had at least a high school level of education.

Finally, the significant predictors of HIV infection status included education

level (≥University: OR=0.60, 95% CI=0.01, 0.54) and number of sex partners (≥2 partners: OR=16.22, 95% CI=2.13, 133.79) when all possible confounders were adjusted for.

Table 16: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and awareness and knowledge in men who tested positive for HBV infection.

Variables	Total n=619	HBV Positive n=83(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
≥40	91	9(9.9)	Ref	Ref
<30	301	45(14.9)	1.60[0.75-3.41]	1.68[0.69-4.09]
30-39	227	29(12.8)	1.33[0.60-2.94]	1.20[0.50-2.84]
Education Attainment				
≤Secondary	172	38(22.1)	Ref	Ref
High School	286	36(12.6)	**0.48[0.29-0.79]**	0.63[0.34-1.16]
≥University	161	9(5.6)	**0.20[0.10-0.44]**	**0.23[0.08-0.63]**
Occupation				
Civil servants/ professionals	139	15(10.8)	Ref	Ref
Business	201	24(11.9)	1.00[0.50-2.02]	0.56[0.25-1.19]
Farming	141	25(17.7)	1.68[0.84-3.36]	0.68[0.31-1.52]
Student	106	12(11.3)	0.81[0.33-1.97]	0.84[0.31-2.27]
Unemployed	32	7(21.9)	1.82[0.63-5.21]	2.73[0.86-8.76]
Health information seeking experience				
Ever	376	40(10.6)	Ref	Ref
Never	243	43(17.7)	**1.76[1.11-2.81]**	**1.37[1.06-2.38]**
Infectious disease education experience in outreach programs				
Never	144	26(18.1)	Ref	Ref
HIV	314	40(12.7)	0.65[0.37-1.12]	0.54[0.29-1.00]
Malaria	51	5(9.8)	0.52[0.19-1.45]	0.47[0.16-1.40]
Hepatitis	17	3(17.6)	0.94[0.25-3.55]	0.99[0.23-4.32]
Others	93	9(9.7)	0.50[0.22-1.12]	0.50[0.19-1.27]
Number of sex partners in last 1 year				
None	70	2(2.9)	Ref	Ref
1 partner	340	31(9.1)	**4.32[1.02-18.92]**	**7.71[1.68-35.65]**
≥2 partners	209	50(23.9)	**12.98[3.02-55.79]**	**21.35[4.64-98.33]**
Aware of HBV infection				
Yes	330	32(9.7)	Ref	Ref
No	289	51(17.7)	**1.97[1.22-3.17]**	…..
Knowledge level of HBV infection				
Relatively higher	296	32(9.5)	Ref	Ref
Relatively lower	323	51(17.0)	**1.92[1.19-3.09]**	…..

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model
Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

Table 17: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information, and awareness and knowledge in men who tested positive for HCV infection.

Variables	Total n=619	HCV Positive n=30(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
≥40	91	4(4.4)	Ref	Ref
<30	301	11(3.7)	0.83[0.26-2.65]	1.21[0.34-4.60]
30-39	227	15(6.6)	1.54[0.50-4.77]	1.82[0.54-6.20]
Education Attainment				
≤Secondary	172	13(7.6)	Ref	Ref
High School	286	12(4.2)	0.53[0.23-1.20]	0.51[0.20-1.33]
≥University	161	5(3.1)	0.39[0.14-1.14]	0.30[0.07-1.27]
Occupation				
Civil servants/ professionals	139	6(4.3)	Ref	Ref
Business	201	13(6.5)	1.56[0.56-4.32]	1.52[0.51-4.58]
Farming	141	8(5.7)	1.37[0.46-4.09]	1.14[0.33-3.97]
Student	106	3(2.8)	0.80[0.17-3.83]	1.79[0.34-9.37]
Unemployed	32	0(0.0)	…..	…..
Health information seeking experience				
Ever	376	14(3.7)	Ref	Ref
Never	243	16(6.6)	1.89[0.90-3.98]	1.97[0.85-4.57]
Infectious disease education experience in outreach programs				
Never	144	5(3.5)	Ref	Ref
HIV	314	12(3.8)	0.99[0.34-2.90]	1.06[0.35-3.23]
Malaria	51	6(11.8)	**3.55[1.02-12.37]**	**4.63[1.23-17.35]**
Hepatitis	17	0(0.0)	…..	…..
Others	93	7(7.5)	2.0[0.62-6.70]	3.00[0.80-11.24]
Number of sex partners in last 1 year				
None	70	19(0.0)	Ref	Ref
1 partner	340	15(4.4)	**4.92[1.47-18.16]**	**5.68[2.20-23.22]**
≥2 partners	209	15(7.2)	**9.44[1.98-50.31]**	**12.96[2.88-60.18]**
Aware of HCV infection				
Yes	284	13(4.6)	Ref	Ref
No	335	17(5.1)	1.17[0.55-2.46]	0.74[0.01-1.09]
Knowledge on HCV				
Relatively higher	273	11(4.2)	Ref	Ref
Relatively lower	346	19(5.3)	1.46[0.68-3.15]	3.64[0.58-22.71]

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model
Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

Table 18: OR and CI of sociodemographic characteristics, selected general healthy behaviors and history of risk exposures information in men who tested positive for HIV infection.

Variables	Total n=619	HIV Positive n=42(%)	OR[a] [95% CI]	OR[b] [95% CI]
Ages				
≥40	91	4(4.4)	Ref	Ref
<30	301	23(7.6)	1.80[0.60-5.34]	1.54[0.44-5.35]
30-39	227	15(6.6)	1.54[0.50-4.77]	1.25[0.37-4.25]
Education Attainment				
≤Secondary	172	20(11.6)	Ref	Ref
High School	286	21(7.3)	0.56[0.29-1.09]	0.63[0.30-1.31]
≥University	161	1(0.6)	**0.05[0.01-0.35]**	**0.06[0.01-0.54]**
Occupation				
Civil servants/ professionals	139	4(2.9)	Ref	Ref
Business	201	16(8.0)	2.70[0.87-8.42]	1.55[0.48-5.05]
Farming	141	12(8.5)	3.02[0.94-9.68]	1.18[0.34-4.02]
Student	106	8(7.5)	2.36[0.62-9.01]	2.66[0.65-10.84]
Unemployed	32	2(6.2)	1.94[0.32-11..85]	2.68[0.40-18.06]
Health information seeking experience				
Ever	376	18(4.8)	Ref	Ref
Never	243	24(9.9)	**2.12[1.12-4.01]**	1.42[0.71-2.85]
Infectious disease education experience in outreach programs				
Never	144	10(6.9)	Ref	Ref
HIV	314	24(7.6)	1.07[0.49-2.33]	1.16[0.50-2.67]
Malaria	51	5(9.8)	1.58[0.51-4.92]	1.85[0.54-6.33]
Hepatitis	17	0(0.0)	…..	…..
Others	93	3(3.2)	0.46[0.12-1.72]	0.63[0.15-2.62]
Number of sex partners in last 1 year				
None	70	1(1.4)	Ref	Ref
1 partner	340	15(4.4)	4.00[0.51-31.70]	6.89[0.83-57.51]
≥2 partners	209	26(12.4)	**11.7[1.52-89.43]**	**16.2[2.13-133.8]**
Ever been transfused of blood				
No	590	39(6.6)	Ref	Ref
Yes	29	3(10.3)	1.86[0.50-6.11]	1.28[0.33-4.92]
Have a family member infected with HIV, HBV or HCV				
No	510	32(6.3)	Ref	Ref
Yes	109	10(9.2)	1.59[0.75-3.35]	1.34[0.61-2.93]

OR =odds ratio; Ref =reference; [a] Adjustment for age; [b] Multiple logistic regression model Infectious disease education (others): Cholera, tuberculosis, polio, measles, influenza, Ebola.

4. Discussion and Implications

4.1 Major findings

The results indicated that the awareness of both HBV (53.6%) and HCV (45.9) infections among blood donors in the Kumba health district was very low. Similarly, this sub-population group lacked adequate knowledge on these infections as only 48.0% and 37.6% had relative higher knowledge on HBV and HCV. For HBV infection, majority of the participants were lacking in the areas of modes of transmission, treatment and effectiveness of the HBV vaccine. This was virtually the same for HCV infection as most donors confused exchange of saliva as a mode of transmission and thought HCV had a vaccine. Significant correlates for knowledge and awareness of HBV and HCV infections included; education level, health information seeking behavior, health education experience, frequent blood donation and HBV vaccination status.

In contrast to the low awareness and knowledge of HBV and HCV infections, 99.8% and 99.2% of these same donors were aware and had relatively higher knowledge respectively of HIV infection. This can be explained by the systematically and effectively well implemented HIV sensitization and intervention programs in all communities and populations of the country. As shown, about 50% of all donors indicated that they had experienced HIV education in community outreach and other health programs. Therefore, we recommend the implementation of such similar community-based sensitization and intervention programs for HBV and HCV infections too. Since all three

infections are viral infections which share similar characteristics and mode of transmission, these programs proven to have been effective in increasing HIV awareness and knowledge will also be effective in increasing that of HBV and HCV infections among the general population and blood donors.

Despite the relatively higher knowledge on HIV, about a quarter of blood donors thought HIV infected women on ARV drugs cannot breastfeed their babies. As such, HIV sensitization protocols should be frequently updated to include recent advances in HIV prevention medicine.

When we further analyzed the population of donors who had previous experience in health education on HBV and/or HCV infections, we found that 94.1% and 70.6% of them had significantly higher knowledge on HBV and HCV respectively and uptake of HBV vaccine among them was 29.4%. This further proof that a well implemented sensitization program for HBV and HCV would be effectiveness in increasing awareness and knowledge on these infections as in the case of HIV awareness and knowledge.

In this study, the rate of HBV vaccine uptake among participants was very low (6.5%). This is explained by a combination of lack of awareness and limited knowledge HBV vaccine and the lack of HBV vaccination programs. This low uptake of HBV vaccine extends even to surgical workers who are perceived to be at greatest risk exposure to these infections. In one study on HBV vaccine uptake among surgical workers in Cameroon, although 98% of the surgical workers knew about HBV vaccine and 89.8% knew they were at greatest risk of contracting this infection, only 24.5% of them had received full course of 3 dose

of HBV vaccine[43]. In another similar study conducted to assess knowledge of HBV infection, HBV vaccine uptake, and to determine the serological profile of health care workers in Yaoundé, Cameroon, they found that only 47% of the health care workers had adequate knowledge on the infection and HBV vaccine uptake was equally very low (19%), with HBV prevalence of 11%[44]. From the results of our study, community vaccination programs against HBV infection are urgently in need in the population of the Kumba Health District and, if possible, a national HBV vaccination campaign.

Another important finding in this study was the fact that the sexual route was the most probable and significant means of transmission of these viral infections as about 90% of donors were sexually active, with 31.88% of them reporting to have had more than one sex partner within the last one year. This is probably the reason why despite the awareness and good knowledge of HIV, its prevalence was still high among study participants. Therefore, we recommend an urgent introduction of sexual behavior education programs among blood donors and the general population as a whole, to interrupt the transmission of these infections. This is particularly important for donors from polygamous homes as the habit of having more than one sexual relationship was most frequent among them (65.4% of donors from these homes reported multiple sex partners). There was no significant difference in prevalence for all three infections among participants who had or lived with family members infected with any of the infections compare to those who did not. Also, there was no significance for past transfusion history as a means of transmission of any of these infections.

Similar to other most previous studies involving the population of blood donors where the majority of them are often family replacements, 77.4% of donors in this study were replacement donors, 13.9% were donating for money while only 8.7 were voluntary donors. Moreover, a very important observation made was the fact that there was no system in place for follow-up and treatment of positive cases after screening even for those who tested positive for HIV in all study sites. This is very critical as very few of the replacement donors actually came back for the screening results as they were only interested in replacing the blood used by the family members or friends. This means that most of these donors are likely to donate blood more than once without finding out that they were infected with one or more of these infections and is likely the reason why the awareness and knowledge of HBV and HCV was quite low even among donors with previous history of blood donation ≥2 times. The act of relying on the self-willingness of blood donors to come back for their screening results has been ineffective. Therefore, we recommend the incorporation of appropriate systems for follow-up and initiation of treatment of positive cases from blood donation screening in all hospitals operating blood transfusion services in Cameroon.

4.2 Strength

Firstly, this study was the first to assess knowledge and awareness of HBV and HCV infections in a population in the Southwest Region of Cameroon. Secondly, the study participants were recruited from multiple blood donation

sites including Presbyterian, Catholic and public health facilities thereby increasing the chances of including donors who adhere to specific hospitals because of religious attachments. Finally this study had approximately 100% response rate. This can be explained by the fact that, majority of patients and their families have great trust and respect for health care workers and easily adhere to participation in studies when requested by these health workers. Moreover all interviewers were well trained and dedicated to the study.

4.3 Limitations

The study had several limitations that should be taken into account. Firstly, there is lack of strong scientific evidence regarding measure of awareness and knowledge. A quantitative measure of awareness using a yes or no question as well as quantitative measure of knowledge using total number of correct answers for HBV, HCV and HIV related statements may not be the objective validation of measure for awareness and knowledge respectively. Secondly, the population of female donors recruited in this study was very small. As such, only the characteristic factors associated with the awareness and knowledge of study infections in the male population were described. Young and vibrant males are often the people of choice for donation and only when there are no males in a family before females are allowed to donate. Thirdly, this study was limited to the population of blood donors rather than the general population of the Kumba Health District. Thus the generalizability of the present study may be limited due to that and also due to the fact that people selected for blood donation are often

the healthiest ones. As such, a further study is required to ascertain the level of awareness and knowledge of these infections in the general population of the Kumba Health District. Finally, cross-sectional studies are not designed to determine a causal relationship. It is possible that some other factors which can account for the knowledge and awareness status of study participants about these infections might have been missed in the present study.

5. Conclusion

In conclusion, the knowledge and awareness of HBV and HCV was low, whereas the prevalence of these infections was high among the population of blood donors within the Kumba Health District of Cameroon. This study determined that being aware of and having higher HBV-, HCV-, and HIV-related knowledge can have an impact on the prevalence of these infections. This is particularly the case among blood donors, as those who responded correctly to at least four of six knowledge statements for each infections were significantly associated with a negative infection status for the infections, respectively. Therefore, there is a need to raise awareness and disseminate appropriate knowledge to blood donors and the general population to encourage positive attitudes, promote healthy behaviors, and therefore reduce the spread of these infections. This study has important implications for public health policies and supports the need for behavioral intervention strategies to engage people in healthy behaviors, especially sexual behaviors.

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