

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**



**HIV, HBV, HCV AND SYPHILIS INFECTIONS AMONG BLOOD
DONORS IN KOFORIDUA, GHANA**

BY

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
THE AWARD OF MPhil PUBLIC HEALTH DEGREE.**

JULY, 2016

DECLARATION

I, Alomatu Holy, declare that this proposal is my original work, except for duly referenced ones and that no form of this has been presented elsewhere wholly for the award of any degree.

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SUPERVISOR

.....
DATE



DEDICATION

I dedicate this thesis work to my lovely wife, family and all who's efforts in one way or the other made this dream come true.

God bless you all.



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I wish to use this opportunity to thank the Almighty God who through thick and thin has been faithful to me and has seen me through my course of study.

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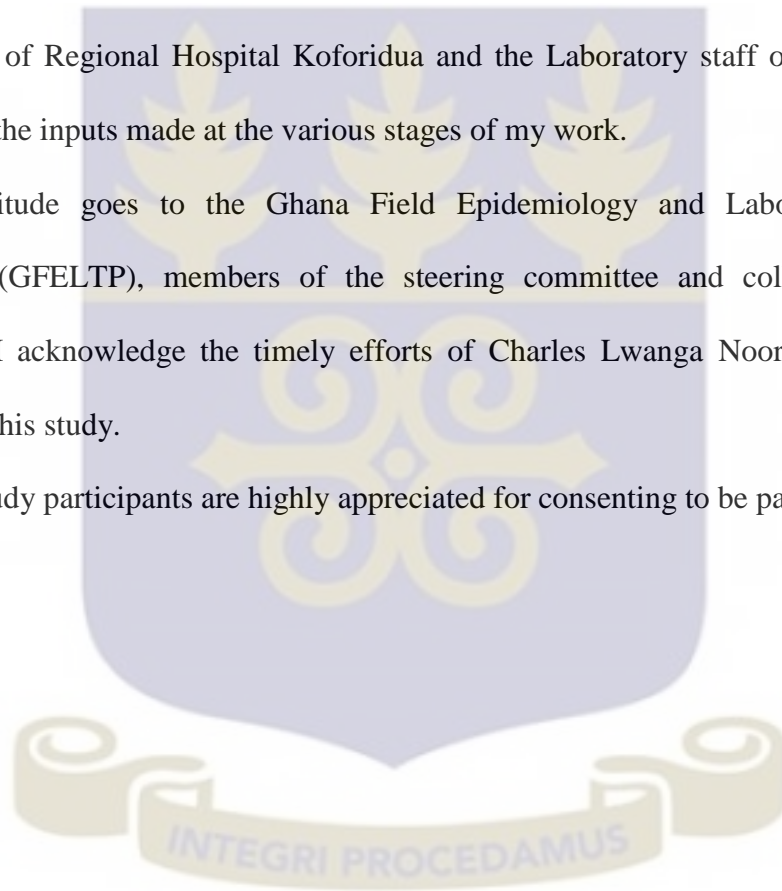


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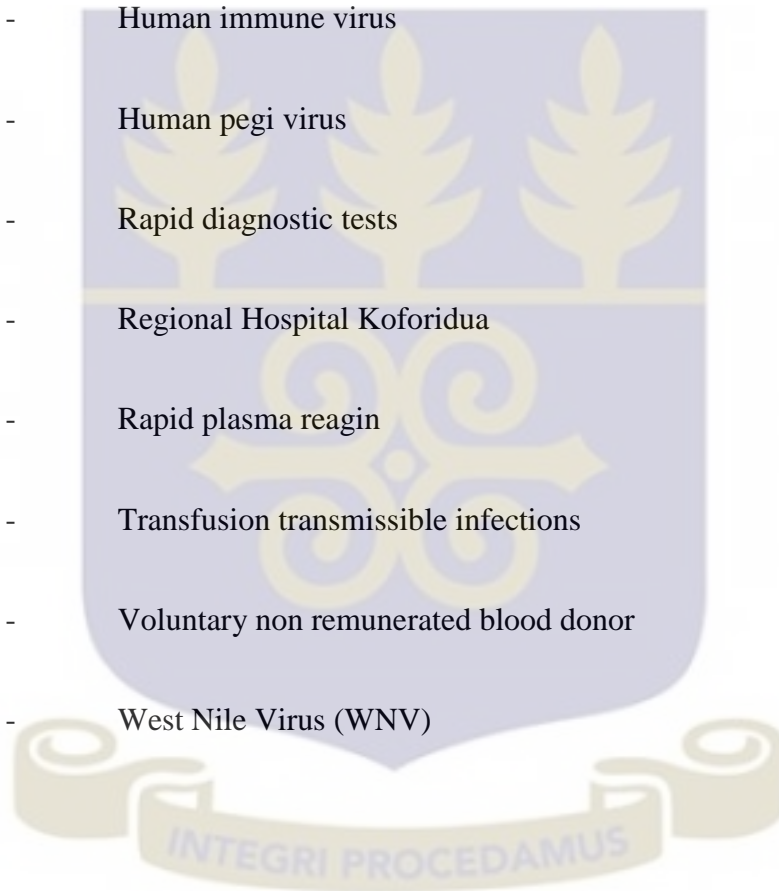
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LIST OF ABBREVIATIONS

CMV	-	Cytomegalovirus
EDTA	-	Ethelyne diamine tetra acetic acid
HBV	-	Hepatitis B virus
HCV	-	Hepatitis C virus
HIV	-	Human immune virus
HPgV	-	Human pegi virus
RDTs	-	Rapid diagnostic tests
RHK	-	Regional Hospital Koforidua
RPR	-	Rapid plasma reagin
TTIs	-	Transfusion transmissible infections
VNRBD	-	Voluntary non remunerated blood donor
WNV	-	West Nile Virus (WNV)



ABSTRACT

Background: HIV, HBV, HCV and syphilis infections can be transmitted from person-to-person through parenteral administration of blood or blood products. These infections among blood donors are of public health concern because of their prolonged viraemia and carrier of latent state. This study determined the prevalence of HIV, HBV, HCV, and Syphilis infections, and associated factors among blood donors in Koforidua.

Method: A cross-sectional study was conducted at St Joseph hospital and the Regional Hospital in Koforidua. Blood donors were recruited and interviewed. Socio-demographic and behavioral factors of the blood donors were obtained after which 5ml of blood was drawn from each of them. The blood was tested for HIV, HBV, HCV and syphilis infections using rapid test kits. Data was entered and cleaned in epi info version 3.5.3 and exported to Stata 13.0 for analysis. Categorical variables were analyzed and presented as percentages. Univariate analysis was done to determine associations and logistic regressions to identify significant variables.

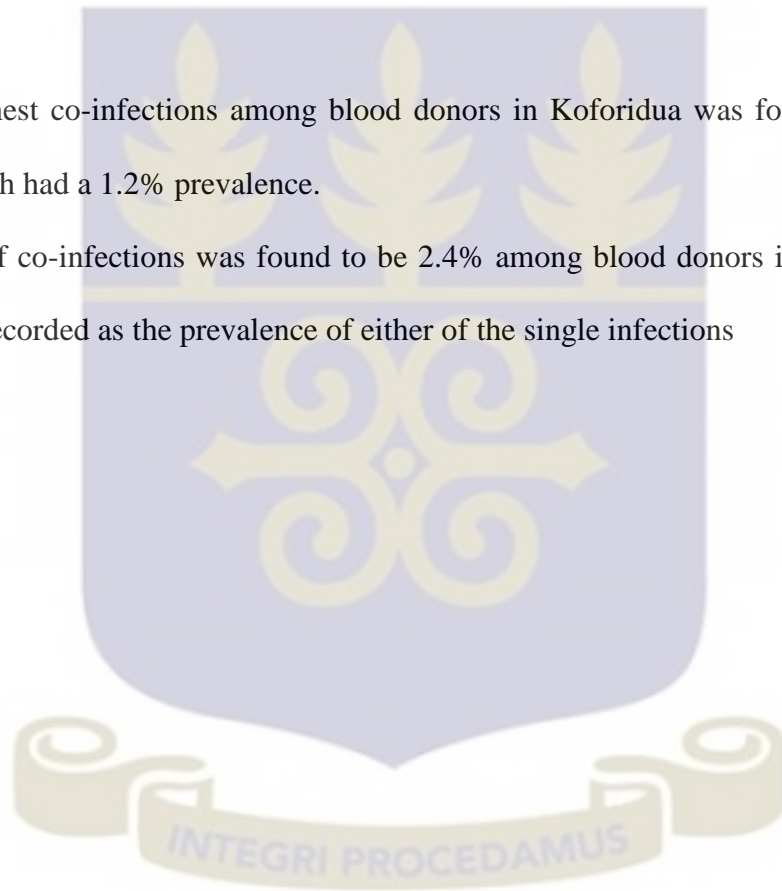
Results: The study recruited 426 blood donors. Majority, 85.7% (365/426) were males and 59.1% of the total blood donors had secondary education. The study found 4.5% (19/426) prevalence of HIV, 13.2% (56/426) prevalence of HBV, 8.0% (34/426) prevalence of HCV and 15.3% (65/426) prevalence of syphilis among blood donors in Koforidua. Co-infections among blood donors was HIV - HCV 0.4% (2/426), HIV - Syphilis 0.2% (1/426), HBV - Syphilis 1.2% (5/426) and HCV - Syphilis 0.4% (2/426). 36.2% (154/426) were positive for one (1) out of the four (4) infections screened. 2.4% (10/426) of the donors had co-infections of the pathogenic markers. The commonest co-infections was HBV-Syphilis co-infections.

Conclusion: In this study, the prevalence of HIV among blood donors in Koforidua was 4.5%. Hepatitis B and C prevalence were found to be 13.2% and 8.0% respectively among blood donors while syphilis prevalence was 15.3%.

Socio-demographic and behavioral factors found to be significantly associated with HIV, HBV, HCV and syphilis infections among blood donors in Koforidua were residence of the donor, religion, educational level, occupation, category of donor, biological sex and alcohol use.

The commonest co-infections among blood donors in Koforidua was found to be HBV-syphilis which had a 1.2% prevalence.

Prevalence of co-infections was found to be 2.4% among blood donors in Koforidua and 36.2% was recorded as the prevalence of either of the single infections



CHAPTER ONE

INTRODUCTION

1.1 Background

Human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV) and syphilis are infections which can be transmitted from person-to-person through parenteral administration of blood or blood products. It may also result from new or emerging infectious agents, which are not known to be transmitted, but for which there is biological plausibility of person-to-person transmission. Such an example is the agent responsible for new variant Creutzfeldt-Jacob Disease (CDC, 2004). A transfusion transmitted infection (TTI) is any infection identified in a recipient that is suspected to have been transmitted by blood or blood products at any time since 1980, or any infection (with potential for blood-borne transmission) identified in a blood donor who was infectious at the time they donated blood at any time (Hladik et al., 2006). Any infections with the potential of being carried from person to person as a result of blood transfusion are TTIs (Walana, et al., 2014).

Other infections that have been detected include cytomegalovirus and Epstein Barr virus. Preventing transmission of these infectious diseases through blood transfusion presents one of the greatest challenges of transfusion medicine (Chandra Sharma et al., 2014).

HIV, HBV, HCV and syphilis infections among blood donors are of public health concern. There is a general focus on safety and protection of human life in blood transfusion practices over the world. These infections are of great public health concern because of their prolonged viraemia and carrier of latent state (Tessema et al., 2010).

HIV, HBV, HCV and syphilis infections are common globally, especially among people with a history of blood transfusion (Chandra Sharma et al., 2014). Transfusion

transmissible infections include malaria, HIV, HBV, HCV, syphilis (VDRL), Variant Creutzfeldt-Jakob disease (vCJD), human T-cell lymphotropic viruses (HTLV-I/II), Cytomegalovirus (CMV), Parvovirus B19, West Nile Virus (WNV), Dengue virus, trypanosomiasis. The prevalence of these infections is high ranging from 3.7% for HBV to 23.2% for HCV (Adjei et al., 2006). In Ghana, HIV, HBV, HCV and syphilis accounts for more than two thirds of all infections particularly among blood donors.

The importance of blood transfusion in modern therapy and health care delivery cannot be overstated. These infections could defeat the whole purpose of blood transfusion in the health care system as they spread through tainted blood collected from an infected blood donor. Laboratory testing of blood to eliminate infections is very crucial to ensure that these infections are not transmitted to ensure safe healthcare delivery through blood transfusions. The screening for HIV, HBV, HCV and syphilis among blood donors can be a cost-effective approach to monitor the prevalence, distribution, and trends of these infections within human populations.

1.2 Problem statement

In Ghana the common infections (pathogenic markers) screened for before blood is termed safe for transfusion are HIV, HBV, HCV and syphilis (WHO, 2014). In resource constrained countries like Ghana, screening is poorly and incompletely done for these infections (Chandra Sharma et al., 2014). Syphilis in particular is sometimes not screened for especially when the test strips are not available and the blood from a donor is not to be transfused the same day (Sarkodie et al., 2016).

In most transfusion centres in Ghana, sequential screening is done for blood donor samples. Sequential screening is where the blood sample is tested for one infection at a

time for the test results before proceeding to screen for another infection for the same sample. A donor is not screened further if the donor tests positive for any of the infections. The reason for this practice of sequential screening is that once the donor has already tested positive for one of the infections, the blood is already not wholesome hence to further continue to screen for the other infections is a waste of time and resources because the blood will still not be used. Therefore it is better the screening process is stopped to conserve the remaining test strips for screening other donors in future. This negatively affects the donor and the community at large since the donor could be having some of the other infections and will not receive early and possible medical care. The sequential screening pattern results in missed opportunity to determine other infections (co-infections) among blood donors.

This ultimately leads to inaccurate figures being made available as the prevalence of these infections among blood donors. These inaccurate figures eventually go to inform policy. These inaccurate prevalence of the infections is arrived at because the sequential pattern of screening does not offer a common denominator to be used to calculate the prevalence of the infections. Because at one point in time, the laboratory may do a lot of HBV testing more than syphilis testing depending on the outcome of the HBV test result.

There is the likely hood of transfusing tainted blood where syphilis is not screened for any reason. This study determined the prevalence and co infections of HIV, HBV, HCV and syphilis infections among blood donors in Koforidua.

1.3 Objectives

1.3.1 General Objectives

To determine the prevalence of HIV, HBV, HCV and Syphilis infections among blood donors in Koforidua.

1.3.2 Specific Objectives

1. To determine the prevalence of HIV, HBV, HCV and syphilis among blood donors.
2. To determine behavioral and socio-demographic factors associated with HIV, HBV, HCV, and syphilis infections among blood donors.
3. To determine co-infections of HIV, HBV, HCV, and syphilis infections among blood donor in Koforidua.



Figure 1: Conceptual framework of HIV, HBV, HCV and Syphilis among blood donors.

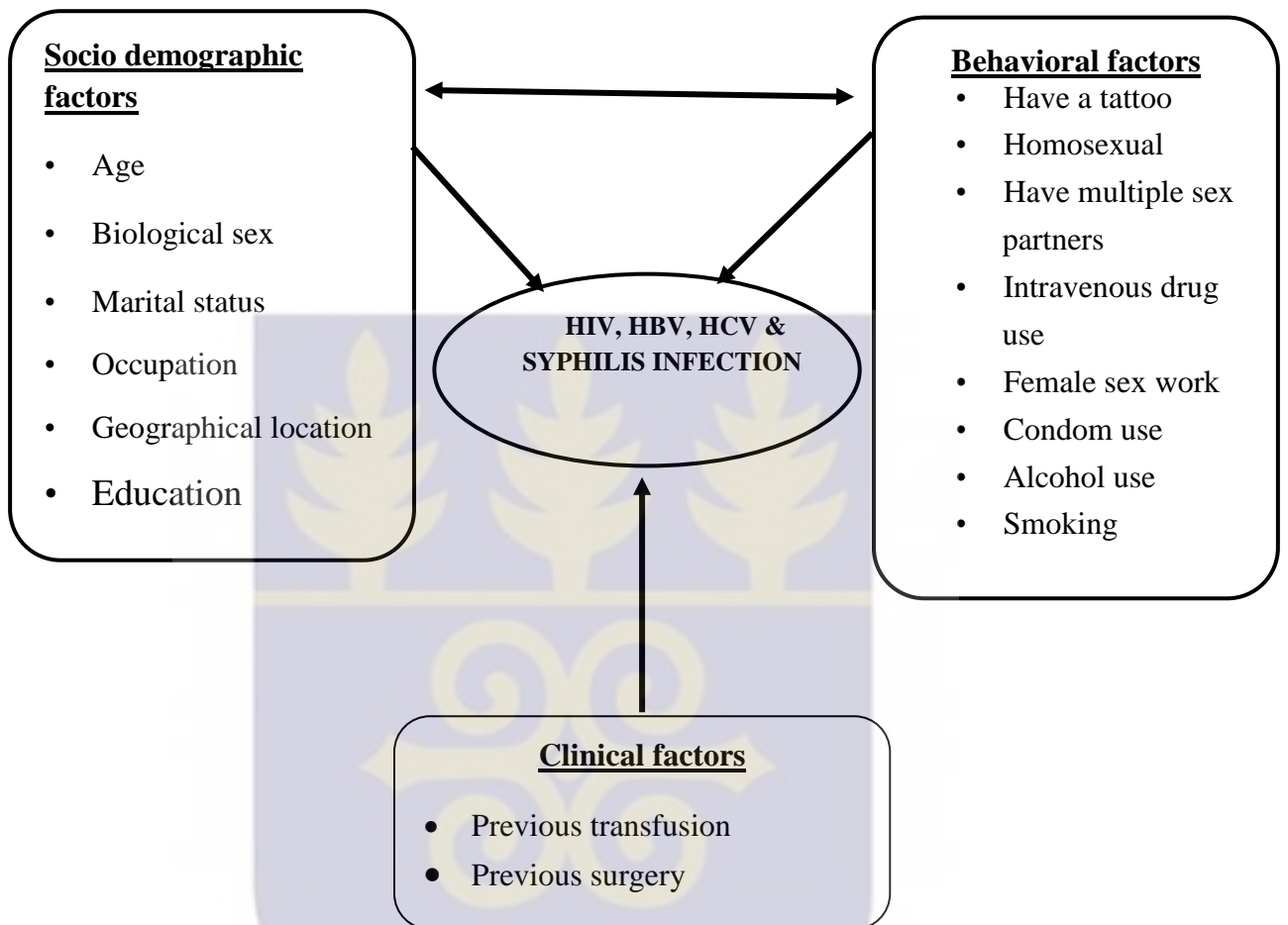


Figure 1 shows a conceptual framework of HIV, HBV, HCV, and syphilis infections and associated factors. These factors have been grouped into three broad categories; Socio-demographic factors, Behavioral factors and Clinical factors.

Some earlier studies identified some socio-demographic factors as possible predictors of these infections including age (Allain et al., 2003), biological sex (Ampofo et al., 2002), occupation (Jafri et al., 2006), Education (Jafri et al., 2006), geographical location ethnicity, (Chaurasia et al., 2014)

Other studies citing some behavioral factors include have a tattoo (Jafri et al., 2006), homosexual, have multiple sex partners (Duda et al., 2005), intra drug users (Jafri et al.,

2006), female sex work (Duda et al., 2005), smoking status, alcohol use and use or non-use of condom.

Clinical factors include previous transfusion and previous surgery (Jafri et al., 2006).

1.4 Justification

There is paucity of data on prevalence TTI infections among blood donors in the Eastern Region of Ghana. The study seeks to bring to the knowledge of all, particularly stakeholders and policy makers the trends of HIV, HBV, HCV and syphilis infections among blood donors in Koforidua in order to direct interventions and resources.

The findings from this study would help strengthen and streamline policy on the pattern of screening by laboratories for blood donors and also afford blood donors the opportunity to know the potential different type of infections they harbor.



CHAPTER TWO

LITERATURE REVIEW

2.1 Blood donation

Blood transfusion is very vital in the area of healthcare delivery. It offers a form of supportive care for both surgical and medical patients (Walana et al., 2014). To equip the blood bank with pints of blood, blood is sourced from commercial blood donors, voluntary blood donation and from family replacement blood donation (Bloch et al., 2012).

Commercial blood donors are people hired to donate blood for a fee. They are either called by officials of the blood bank to donate or are contracted by individuals in need of the blood. They are paid for the blood donation (Bloch et al., 2012).

Voluntary donors are people who donate blood to the various hospitals and blood banks for the use of the health facility at no cost to the health facility. In sub-Saharan Africa, apart from individuals walking into the health facilities once a while to donate blood voluntarily, most voluntary blood donation comes from organized groups such as churches, keep-fit clubs, associations, organized institutions and educational institutions (Bloch et al., 2012).

The commonest form of blood donation in sub-Saharan Africa is from family or replacement donors. Family or replacement donors are people who have a form of relationship with an individual requiring blood transfusion and is available to donate blood for that purpose. This is where a friend, family member, a spouse, a parent or a sibling gives blood for a relation in time of need.

This form of blood donation happens only when a person needs blood. In the absence of this need there is no blood donation by the donor.

In rare cases, an individual may donate blood for himself or herself for use. This is autologous blood donation (Sachdev et al., 2014) Autologous blood donors do pre deposition of blood for scheduled surgeries due in the very immediate future. The anticoagulant (citrate phosphate dextrose) being used in blood storage, blood is stored for only 34days from the day of collection. Therefore in autologous blood donation the day of use of the blood should be less than 34days since than is the expiry period and the blood is meant for no other individual but the very donor (Cheesbrough, 2009).

2.2 Epidemiology of HIV, HBV, HCV and Syphilis

Seroprevalence of HIV, HBV, HCV and syphilis varies around the world. In Ethiopia it is (HIV: 4.5%, HBV: 8.2%, HCV: 5.8%)(Matee et al., 2006), in Tanzania it is (HIV: 8.7%, HBV: 11%, HCV: 8%, syphilis: 12.7%)(Chandra Sharma et al., 2014a), in Thailand it is (HIV: 0.69%, HBV: 4.61%, HCV: 2.90%)(Shrestha et al., 2009) and Pakistan it is (HBV: 2.45%, HCV: 2.52%)(Buseri et al., 2009)).In Ghana, the seroprevalence of these infections recorded among prison inmates at three prison centres were 19.2% HIV, 17.4% HBV, 19.2% HCV and 11.0% syphilis (Adjei et al., 2006).

2.3 Human Immuno-deficiency Virus (HIV)

The human immunodeficiency virus (HIV) infects cells of the immune system, destroying or impairing their function. Infection with the virus results in progressive deterioration of the immune system leading to “immune deficiency”. Infections associated with severe immunodeficiency are referred to as “opportunistic infections” because they take advantage of a weakened immune system ergo the HIV having a very high morbidity and mortality rate all around the world. Africa has the greatest burden to tackle regarding HIV. Sexual intercourse be it vaginal, anal or oral is one of the major mode of HIV transmission

as well as receiving unwholesome blood during transfusion. Use and reuse of needles, blade, syringes and other sharp objects also contribute to the spread of HIV infections. Vertical transmission of the infections also occur between mother and the unborn child during pregnancy or child delivery as well as to the infant during breastfeeding (WHO 2015). Globally, over 36.9 million people were recorded as HIV carriers in the year 2014. Progression from HIV to AIDS is delayed when proper antiretroviral therapy provided. Over time, the prevalence of HIV in Africa has increased. This is as a result of increased access to antiretroviral hence death due to HIV infection has decreased with increasing survival. New infections of HIV has equally declined (Bloch et al., 2012).

Increasingly, people living with HIV can remain well and productive for extended periods of time, even in low income countries (Chandra Sharma et al., 2014).

HIV infections lead to a greater chance of myocardial infarctions. Liver diseases are equally common with people with HIV infections because carriers of HIV are usually asymptomatic to hepatitis due to co-infections. Blood tainted with HIV will result in approximately 96% seroconversion will be achieved at six months when accidentally a patient is transfused with such blood (Bloch et al., 2012)

HIV infections cause immune activities to rise which leads to the production of interferon- α microbial translocation. Co-infections with other viruses induce expansion of activated specific T-cells and a reduced ratio of T-helper 17 and regulatory T-cells

Since the beginning of the epidemic, almost 78 million people have been infected with HIV and about 39 million people have died of HIV. In 2013 alone, 1.5 million people died of HIV-related illness worldwide (WHO, 2015).

2.4 Hepatitis B Virus (HBV)

It is a viral infection that attacks the liver and can cause both acute and chronic disease. HBV affects humans and non-human primates. It was discovered in 1963 associated with protein antibodies from a patient with haemophilia and leukaemia (Sanguanmoo et al., 2004).

HBV belongs to the family hepadnaviridae and it is a DNA virus. This virus is one of the smallest enveloped viruses and is less than 45nm in diameter (Locarnini, 2004).

HBV is stable and resistant at both humid and extreme temperatures. The virus is effectively destroyed by autoclaving at 121°C for 20 minutes. The virus remains stable and infectious for not less than 7 days in dry blood (Candotti et al., 2007) The virus is transmitted through contact with the blood or other body fluids of an infected person such as serous fluids, blood and blood products, semen, vaginal fluid and saliva. Even though HBV has been identified in low concentrations in body fluids like sweat, urine, breastmilk, tears; there is yet no known study that associates such with the spread of the infections (Allain et al., 2003). It is again not known to be transmitted by food or water, insect bites or other vectors.

Sexual route is the main mode of transmission. Homosexuals are said to be at higher risk. Transmission from an infected man to a woman is easier than from an infected woman to a man.

Among drug users the main mode is by drug injection and tattooing as seen in prison inmates (Adjei et al., 2008).

Nosocomial spread and needle stick injuries do occur among health workers in particular units like the medical ward during transfusion, laboratory, dialysis unit, dental unit, acupuncture, circumcision and ear piercing (Franco et al., 2012).

There is asymptomatic transmission of HBV by carriers through blood donation and subsequent blood transfusion because asymptomatic carriers may test negative during the surface antigen test (HBsAg) for blood donors. An estimated 240 million people are chronically infected with HBV (defined as hepatitis B surface antigen, positive for at least 6 months). More than 780,000 die every year due to its complications, including cirrhosis and liver cancer. HBV is an important occupational hazard for health workers. However, it can be prevented by currently available safe and effective vaccines. The likelihood that infection with the virus becomes chronic depends on the age at which infection occurs (WHO, 2015).

HBV is highly endemic in Africa and hence this translates into an increased translation of HBV infections during blood transfusion. Chronic HBV infections in Africa is estimated at 8% of the population (Walana et al., 2014). Screening for HBV in Africa is mainly the surface antigen (HBsAg). HBV has a lot of chronic carriers in Africa due to horizontal spread during infancy and childhood (Bloch et al., 2012). Childhood HBV vaccination which has been incorporated at birth in Ghana is expected to reduce HBV Infections.

2. 5 Hepatitis C Virus (HCV)

HCV is a liver disease caused by the Hepatitis C virus and found worldwide. The virus can cause both acute and chronic hepatitis infection, ranging in severity from a mild illness lasting a few weeks to a serious life-long illness. It is a blood-borne virus and the most common modes of infection are through unsafe injection practices; inadequate sterilization

of medical equipment and the transfusion of untested blood and blood products. 130 – 150 million people globally have chronic HCV infection (Fabrizi et al, 2002). A significant number of those who are chronically infected will develop liver cirrhosis or liver cancer. Approximately 500,000 people die each year from HCV-related liver diseases (Karki et al., 2008). There is currently no vaccine for HCV. However, research in this area is still ongoing.

HCV infections are given little attention in Ghana even though prevalence rates are high in West Africa and North Africa (Bloch et al., 2012).

Due to the fact that acute HCV infection is usually asymptomatic, few people are diagnosed during the acute phase (Jafri et al., 2006).

2.6 Syphilis

Syphilis is a sexually transmitted disease (STD) that can cause long term complications if not treated correctly. It remains one of the major health problems in sub-Saharan Africa. It is common in blood donors. In Ghana there is limited information on the prevalence of syphilis among blood donors. Among prison inmates and officers, it has been reported as 11.0% and 4.9% respectively (Adjei, 2006). In another study it was 16.5% for prison inmates alone (Adjei et al., 2008). Among blood donors, prevalence has been reported to range from 4.7% to 13.5% in Ghana (Owusu-Ofori et al., 2011).

Syphilis screening especially among blood donors is improperly done or in some cases not done at all (Sarkodie et al., 2016). Most laboratories and blood centres use non-specific RDT kits and test strips which are cheap, easy and does not require much trained expertise to use (Sarkodie et al., 2016).

Treponema pallidum, the causative organism for syphilis infections does not survive at temperature of 4.0°C and below. Because of this syphilis screening among blood donors is not done at times especially when there is shortage of test strips in the laboratory (Sarkodie et al., 2016).

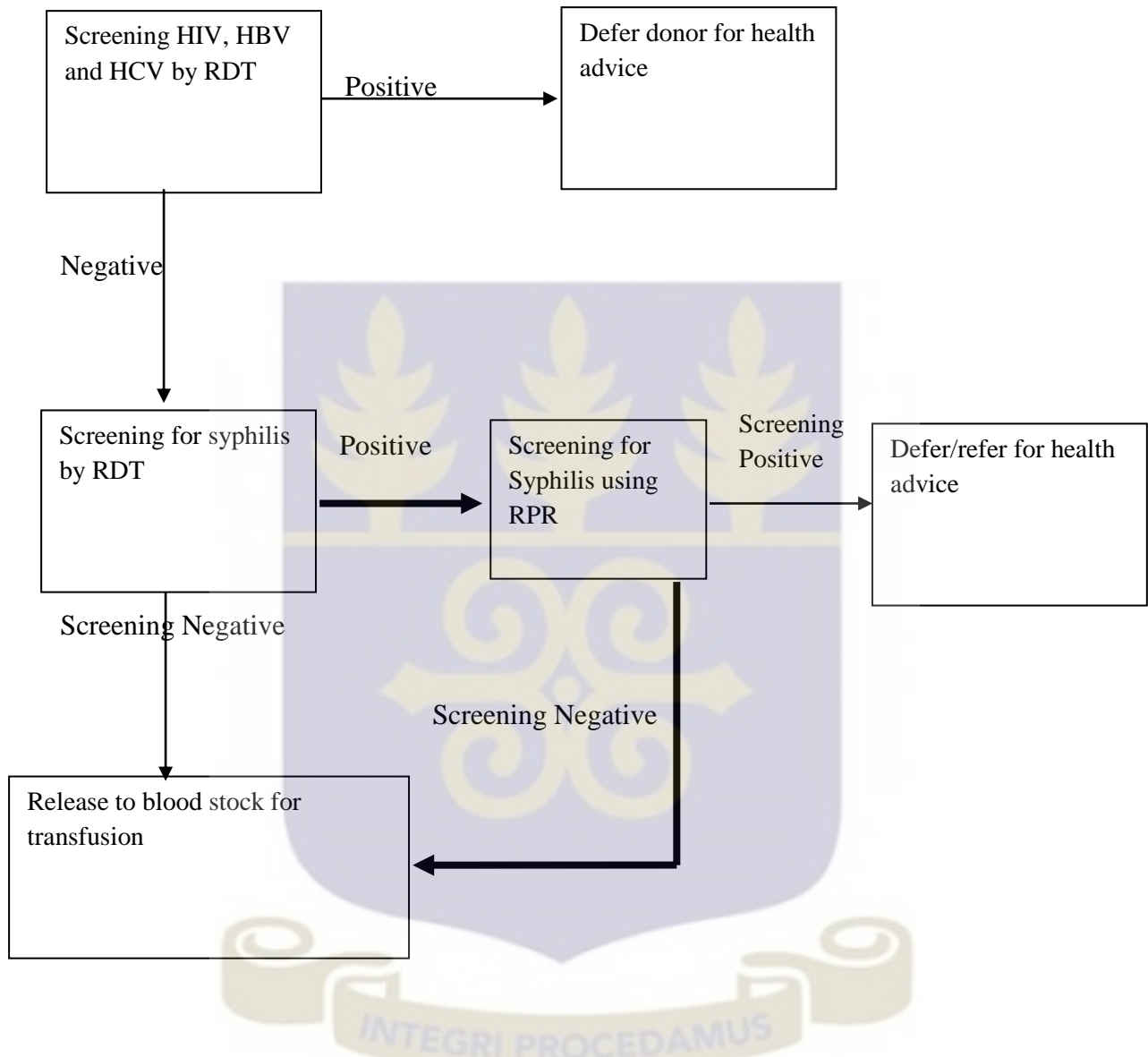
Other studies share dissimilar view indicating that syphilis screening should be done for blood donors always. Temperatures are not constant, stable and properly monitored in sub-Saharan Africa. Quality assurance is poorly handled for laboratory refrigerators hence the assumption that refrigeration would kill *Treponema pallidum* that may be present in refrigerated blood is not guaranteed (Bloch et al., 2012).

Blood transfusion often comes with the administering of some antibiotics to the recipient of the blood. It is assumed that these antibiotics would treat any prospective syphilis infections in the donor blood that had been given to the recipient of the blood due to the blood transfusion (Sarkodie et al., 2016).

To ensure effective screening among blood donors Komfo Anokye Teaching Hospital has developed a new algorithm for syphilis screening among blood donors (Sarkodie et al., 2016).



Figure 2: Algorithm for screening syphilis at Komfo Anokye Teaching Hospital, Kumasi



Symptoms in adults are categorized as primary, secondary, latent or late syphilis. The infection can spread by direct contact with a syphilis sore during vaginal, anal or oral sex. Sores can be found on the penis, vagina, and anus and in the rectum or on the lips and in the mouth. It can also be spread from an infected mother to her unborn baby.

Blood tests can be used in testing for syphilis. Some health care providers diagnose it by testing fluid from a syphilis sore. It can be cured with the right antibiotics. However, treatment will not undo any damage done by the infection. An individual's previous

history of syphilis infection and cure does not offer immunity against possible future contracting of the disease (CDC, 2015). Focus on transfusion transmitted infections in Africa is towards viral infections for which reasons syphilis which is a bacterial infection is given less attention.

Globally, syphilis was the first infection identified for its risk of blood transfusion. *Treponema pallidum* hardly thrives in refrigerated red cells. This is however not applicable to West Africa, for that matter Ghana since temperatures are generally high and effective quality assurance for laboratory refrigerators cannot be guaranteed.

2.7 Screening Tests before Transfusion

The prevalence of transfusion transmissible infections among blood donors in an area is highly dependent on the load of transfusion-transmitted infections in that particular population. The World Health Organization (WHO) recommends that blood and blood products to be transfused should be screened for HIV, HBV, HCV and Syphilis.

In every population especially those with higher prevalence of transfusion transmissible infections, the risk of transmitting any of these infections; HIV, HBV, HCV and syphilis is higher in blood and blood products obtained from remunerated or replacement donors than voluntary non-remunerated donors and repeat donors (WHO, 1999).

2.8 Co-infections of HIV, HBV, HCV and Syphilis

Blood transfusion is the simplest organ transplant which is mainly aimed at saving life yet it can be life threatening. HIV, HBV, HCV and Syphilis infections and their co-infections are a major cause of Acquired Immune Deficiency Syndrome (AIDS). This is as a result of their chronicity, liver cirrhosis, hepatocellular carcinoma, as well as predisposing one to

opportunistic infections (Farshadpour et al, 2016). About 15% to 30% of people with HIV are estimated to be co-infected with HCV (Andreoni et al., 2012).

The co-infections of these TTIs is very low among blood donors. According to a recent study done, none of the blood donors studied in South of Iran had a co-infection (Farshadpour et al., 2016).

However, the prevalence of HIV-HCV, HIV-HBV, HCV-HBV and HIV-HCV-HBV among Intravenous Drug Users (IDUs) in Yunnan Province in China were as high as 15.5%, 0.3%, 7.8% and 7.1%, respectively (Zhou et al., 2012).

Both HIV and HCV can cause hepatic fibrosis. According to Lin et al, HIV and HCV co-infections may promote hepatic fibrosis through a process called augmentation of microbial translocation (Lin et al, 2013).

2.9 Risk Factors for HIV, HBV, HCV and Syphilis Infections

Some behavioral factors predispose people to contracting HIV, HBV, HCV and syphilis infections. HIV, HBV, HCV and syphilis are all infections that are related to life style as well. Some groups of people who have higher risk of contracting these infections are men having sex with men (MSM) (Heiligenberg et al., 2012), intravenous drug users, commercial sex workers, having multiple sex partners, outdoor socialization which are more age and sex associated, and occupation; health work could lead to acquiring these infections (Shretha et al., 2010).

The prevalence of these infections are geographically linked as per distribution, hence in endemic regions the prevalence of these infections is expected to be relatively high (Shretha et al., 2010).

Prevalence of these infections are again higher in rural communities than urban areas. This is attributed to educational level and the knowledge of dwellers on these infections. This is seen mainly among prison inmates (Adjei et al., 2006)

2.10 Donor recruitment

Recruiting high risk donors increases the risk of HIV, HBV, HCV and syphilis infections which may go undetected during screening (Bloch et al., 2012).

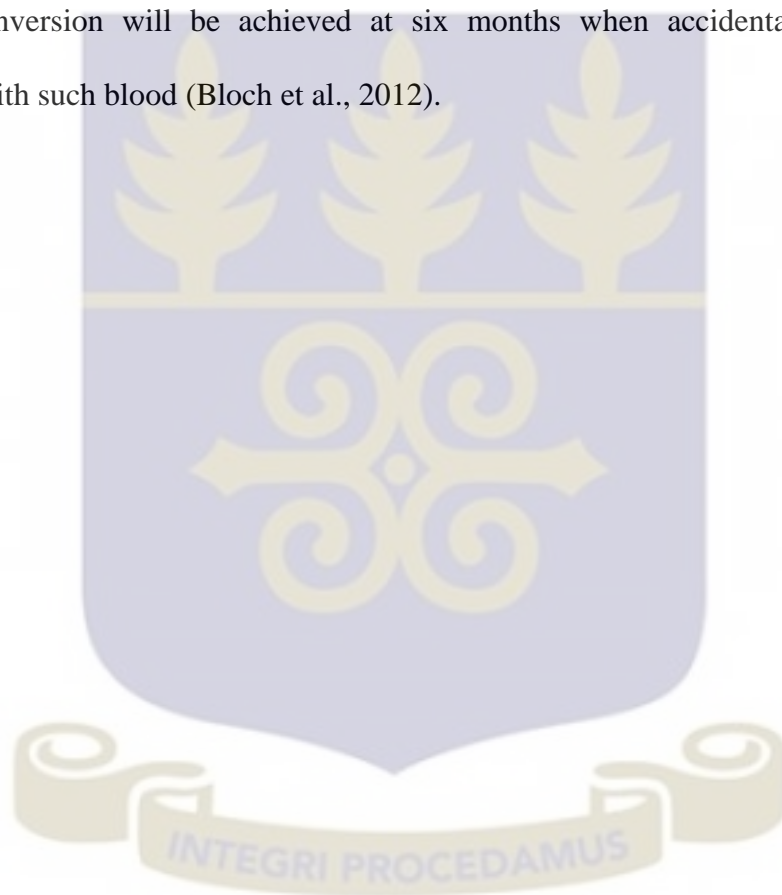
Voluntary non-remunerated blood donors have been found to be of reduced risk of HIV, HBV, HCV and syphilis in developed countries (Bloch et al., 2012).

In Africa it has been found that replacement donation is the main pattern of blood donation (Bloch et al., 2012). Replacement donation account for 75 to 80% of blood for transfusion in Africa. Africa and for that matter Ghana has a few centralized blood centers to support voluntary non remunerated blood donors. Centralized blood centres require storage refrigeration, communication, transportation and quality assurance (Bloch et al., 2012).

Where replacement donors outnumber the voluntary non-remunerated blood donors as it is in Africa, HIV, HBV, HCV and syphilis infections are most likely to be recorded in donated blood because relatives are most likely to deny certain risk lifestyles. Family members are at an increased risk of certain infections especially hepatitis. The risk of HIV, HBV, HCV and syphilis is further increased as far as replacement donation is concerned in cases where family members engage paid donors or contract the services of bleeders and laboratory personals to secure blood, quality is compromised on the side of the bleeders and the paid donor also hides relevant information during the healthy lifestyle screening (Bloch et al., 2012).

Available data shows that in Africa majority of donors are the young (Walana et al., 2014). This is highly indicative of secondary school and other tertiary institutions like training colleges and university students' donor recruitments (Bloch et al., 2012). Males are predominantly the donors due to cultural belief that in Africa males are considered stronger and healthier than females (Bloch et al., 2012).

Blood tainted with HIV will result in increased disease progression and approximately 96% seroconversion will be achieved at six months when accidentally a patient is transfused with such blood (Bloch et al., 2012).



CHAPTER THREE

METHODS

3.1 Type of study

The research was a cross sectional study among blood donors who donated blood at St Joseph hospital and Regional Hospital in Koforidua from January to May 2016.

3.2 Location of study

The study was conducted at the Regional Hospital and St. Joseph Hospital both in Koforidua in the eastern region of Ghana. It was carried out in the blood bank of the two health facilities where blood donors visit to donate blood. St Joseph Hospital is a district hospital and RHK is a referral hospital and both are located in the regional capital of the eastern region of Ghana.

The Eastern Region is the sixth largest region with a land area of 19,323 kilometres square. It lies between latitudes 6 and 7 degrees North and longitude 1.30 West 0.30 degrees East. It is the sixth largest region with a land area of 19,323 kilometers square, which is 8.1% of the land area of Ghana (Ghana Statistical Survey, 2005). It shares boundaries with five other regions: Greater Accra, Volta, Brong Ahafo, Ashanti and Central Regions.

The topography of the region is quite diverse with low lying areas around the valley of the Volta River and Lake and one of the highest reliefs, the Akuapim-Togo- Ranges. The region is well drained with the Volta Lake covering large stretches of the land. By it, transportation is made possible between the southern and northern parts of the country. The suspension bridge on the lake, the Adomi Bridge, is also a major connection between south eastern parts of the country and the Greater Accra region.

The vegetation of the region is tropical and the rainfall pattern is the double maxima with dry and wet seasons. The cultivation of several food crops and cocoa as well as animal rearing have been major agricultural activities in the region. The Kwahu North is a major food crop producing area and belongs to the wide stretch of land referred to as the Afram Plains.

3.2.1 Political and Administrative Structure

The political administrative structure is made of a regional administration and local government structures, namely district assemblies and chieftaincies. The eastern region is one of the ten administrative regions of Ghana. Its capital is Koforidua which is located in the New Juaben Municipality. The next in the hierarchy of political administrative structures are districts and municipalities.

There are twenty-six districts and municipalities in the region. While the districts have a capital with a number of settlements (both rural and urban), the municipalities are larger urban areas covering a wide stretch of urbanized areas but not without clusters of rural areas within their boundaries.

3.2.2 Social Structure

The Akan is the dominant ethnic group. Other major ethnic groups are the Ga-Dangme and the Ewe. The presence of diverse ethnic groups is explained by the presence of migrants who seek employment in the agricultural and other sectors of the economy of the region.

Both patrilineal and matrilineal systems of kinship are found in the region because of the diverse ethnic backgrounds of the residents. (The practices of inheritance are observed by

the patrilineal and matrilineal systems of kinship and descent). The institution of chieftaincy is an important component of the social organization of the region as in the rest of the country.

3.2.3 Economy and living conditions

The economy of the Eastern Region is predominantly agrarian, with both subsistent and commercial production of food and cash crops. Cocoa is a major traditional cash crop produced in the region while pineapple has been the main non-traditional commercially-grown food crop. Pineapple has been a major non-traditional export crop of Ghana too. Agrarian economic activities are the major types of employment in the region, particularly in rural areas.

The physical characteristics of the region support inland fishing, inland water transportation as well as flourishing tourist industry, with ecotourism and festival tourism products. The Akuapim-Togo-Ranges and the Boti Falls are the major ecotourism products while the Odwira Festival of the Akuapim and the annual home-coming of the Kwahu are the festivals that attract both domestic and international visitors and tourists.

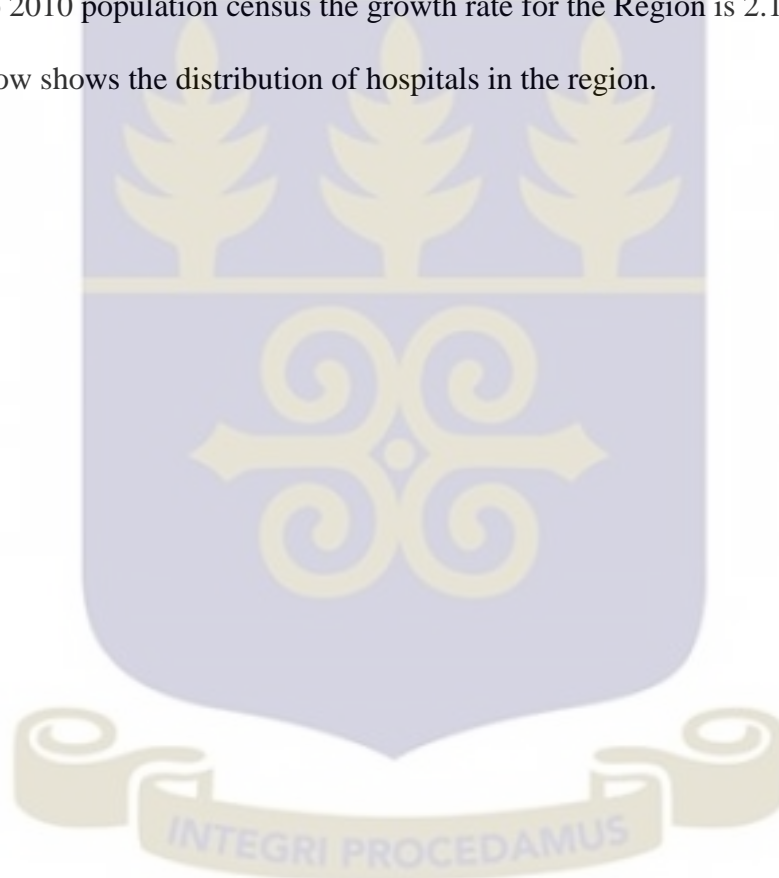
Mining of bauxite (a traditional mineral) and gold (a more recent activity) are also some important economic activities in the Eastern Region. Trade and service sectors have been vibrant in the region. The region comes third after the Greater Accra and Ashanti regions in terms of infrastructural development. It has also benefited from social amenity provision as the level of urbanization has been relatively high.

Out of the 26 districts and municipalities, 18 have at least one hospital however smaller health facilities abound in all districts in the region. The map below shows the distribution of hospitals in the region.

The population of the region is projected to be 2,921,437 for 2015 and is made up of 49% males and 51% females. This is 10.7 percent of the total population of Ghana, a little more than its share of 8.1 percent of the total land area of the country. The population of the Eastern Region is the third highest after Ashanti and Greater Accra regions. The population density of the region rose from 109 to 136.3 per square kilometer between 2000 and 2010 PHC.

According to 2010 population census the growth rate for the Region is 2.1

The map below shows the distribution of hospitals in the region.



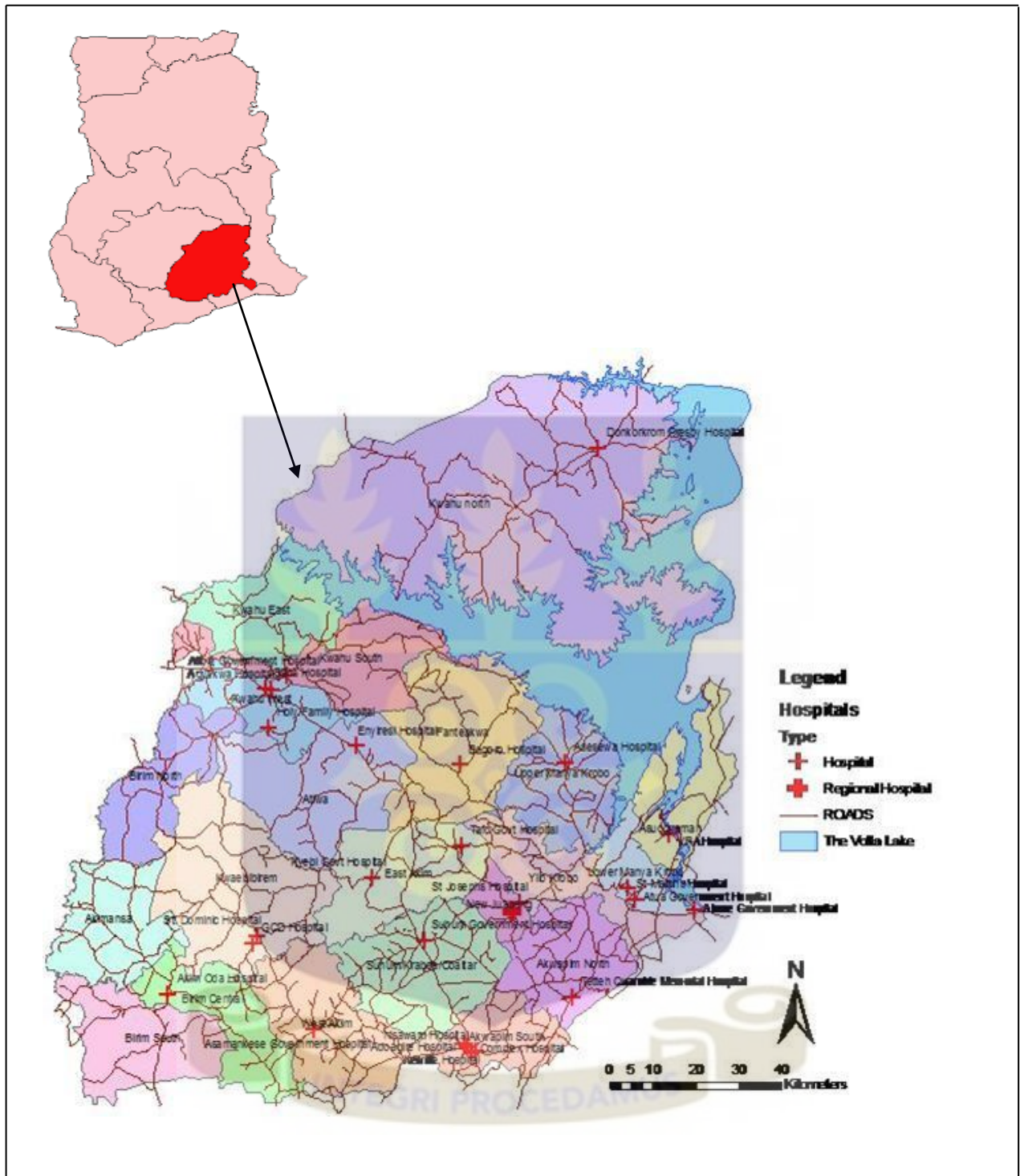


Figure 3: Map of Eastern Region of Ghana and its districts

3.3 Variables

Dependent variables: HIV, HBV, HCV and Syphilis

Independent variables:

3.3.1 Socio demographics factors

Age: Age of participant at the time of study

Sex: Biological classification as either male or female

Residence: Place of residence of the participant at the time of study

Marital status: Classification of participant as married, single, widowed, divorced

Education: Level of formal education attained at the time of study

Occupation: Profession of participant at the time of study

Ever donated: First time donor or repeated donor at the time of study

3.3.2 Behavioral factors

Have a tattoo: Presence or absence of a tattoo on any part of the donor's body

Homosexual: Practice unnatural sexual intercourse with same sex counterpart

Intravenous drug use: Self injection or injection of prescribed drugs by unqualified person

Smoking: Use of tobacco and any illicit drug

Alcohol use: Consumption of alcoholic drinks and beverages

Female sex work: Engage in Commercial sexual activities for a fee

Condom use: Use or non-use of condoms during sexual intercourse

Have multiple sex partners: Have sex with more than one person at the time of study

3.4 Study population

The study involved healthy males and females between the ages of seventeen (17) to fifty-four (54) who visited either St Joseph Hospital or the Regional Hospital Koforidua blood bank to donate blood voluntarily, for a relative (family replacement) or a commercial donor from January to May, 2016

3.5 Sampling

3.5.1 Sample size

The sample size (N) for this study was calculated using the formula

$$N = \frac{Z^2 p(1-p)}{d^2}$$

Where N is the minimum sample size

Z is the standard normal deviation (set at 1.96 corresponding to the 95% confidence interval)

P is the prevalence set at 0.5 (50%)

d is precision or degree of accuracy desired (set at 0.05)

Substituting for the required sample size;

$$N = \frac{Z^2 p(1-p)}{d^2}$$

$$N = (1.96)^2 * 0.5(1-0.5) / (0.05)^2$$

$$N = 384$$

Therefore sample size is 422 (10% non-response rate added were after the blood has been collected the donor declines after results shows positive for an infection)

3.5.2 Sampling method

All donors who met the inclusion criteria and consented were part of my study. The study protocol requires that every blood donor who consents was taken through pre-donation counselling and then interviewed using a well structure questionnaire. Blood donors were recruited each day at both laboratories until the required sample size was obtained. Only voluntary donor and family replacement donors were recruited at St Joseph Hospital. At Regional Hospital Koforidua, the study recruited voluntary donors, family replacement donors as well as commercial donors.

3.6 Inclusion criteria

All persons aged 17 to 59 years who visit the blood bank to donate blood for any reason and consents to be part of the study were included

3.7 Exclusion criteria

All persons who met the inclusion criteria but had donated blood within the past three months from the day of visit were excluded.

3.8 Sample collection

Every prospective blood donor who visited the blood bank and satisfied the inclusion criteria was selected once the person consented to be part of the study. Samples were selected daily until the required sample size of 422 was obtained.

3.9 Specimen collection and testing

All blood donors were referred to the HIV counseling unit as required for pre-donation counseling to be done. For every consenting blood donor, 5ml of venous blood was collected into ethylene diamine tetra acetic acid (EDTA) tube which was screened for

HBV, HCV, HIV and syphilis using the rapid diagnostic kits as being used by the hospital blood bank.

3.10 Laboratory testing and serological analysis

A well-defined laboratory protocol for blood donor screening employs the following stages after pre-donation health check and counselling

- 5ml of venous blood for screening
- Blood type check
- Blood haemoglobin level check
- Serological screening for pathogenic marker
- Donor bleeding or donor referral for healthcare

Laboratory analysis at the two health facilities differed from laboratory testing of blood donor and none conforms strictly to the chronological order.

3.11 Blood donor screening pattern at St. Joseph Hospital

St. Joseph hospital, does the sequential screening where if the donor blood type is not the same as the recipient the donor is not accepted hence the serological screening is not done.

If the haemoglobin level is less than 12.0g/dl, the serological screening is not done.

Serological screening for HIV, HBV, HCV and syphilis infection among blood donors is done sequentially and strictly based on the outcome of a test result being negative.

Serological screening outcomes where a donor is positive for any of the infections is not disclosed to the donor and no medical attention is given to the blood donor.

3.12 Blood donor screening pattern at Regional Hospital Koforidua

At Regional Hospital Koforidua, haemoglobin level is checked first and blood donors with haemoglobin levels of 12.0g/dl and above are taken through all the other serological testing. Referral of a donor positive for any of the infections is not done

3.13 Blood donor screening pattern at the laboratory during the study

During this study strict adherence to the blood donor screening protocol was ensured for all potential donors who visited either of the health facilities and agreed to be part of the study.

Venous blood (5ml) was drawn from the antecubital fossa of all blood donors. The blood type was then determined for all samples taken. The haemoglobin level was checked for all samples. All samples were serologically tested for HIV, HBV, HCV and syphilis infections.

3.14 Laboratory testing materials/test strips

The same screening test strips were used at both health facilities.

HIV was detected using First Response HIV 1-2.0 Card Test (Premier Medical Corporation Limited Kachigam, Nani Daman, Daman (UT) 396215. India) which uses whole blood and buffer at required amounts and timed 20 minutes for HIV results.

HBV was detected using Micropoint One Step HBsAg Test Strip (Micropoint Diagnostics No_ 1692 Xinghu Avenue, Nantong Economy & Technology Development Zone Nantong, 226010 P.R. China) which uses whole blood and buffer at required amounts and timed 20 minutes for HBV results.

HCV was detected using Micropoint One Step HCV Test Strip (Micropoint Diagnostics No_ 1692 Xinghu Avenue, Nantong Economy & Technology Development Zone Nantong, 226010 P.R. China) which uses whole blood and buffer at required amounts and timed 20 minutes for HCV results.

Syphilis (*Treponema pallidum*) was detected using Micropoint One Step Syphilis Test Strip (Micropoint Diagnostics No_ 1692 Xinghu Avenue, Nantong Economy & Technology Development Zone Nantong, 226010 P.R. China) which uses whole blood and buffer at required amounts and timed 20 minutes for syphilis results.

3.15 Data collection process and tools

Blood donors were interviewed by trained data collectors using a questionnaire to collect information on some sociodemographic factors as well as some behavioral factors.

The laboratory screening outcomes of the various infections tested were recorded for each blood donor that was interviewed.

3.16 Quality control

Laboratory procedure

It was ensured that all test strips and buffer were stored at the recommended temperatures.

Expiry dates of test strips and accompanying buffers were crosschecked daily before use for testing.

Quality control tests were done daily to validate the accuracy of the test strips daily with known specimens before use for testing donor specimen.

Interview process

Trained HIV counsellors administered the questionnaire during pre-donation counselling.

Regular supervision and random recheck interview was done by principal investigator.



3.17 Data processing

Data was entered into Epi-info 3.5.4 template already designed by principal investigator by data entry clerks.

Data validation checks were used on the template to avoid errors during data entry.

3.18 Data analysis

Data was entered in Epi-info 3.5.4 and cleaned in MS excel. Data was appended in MS excel and then exported into Stata 13.0 software for analysis. Continuous variables were re-categorized into groups and expressed as proportions. Categorical variables such as sex and marital status were analyzed and presented as percentages. Univariate analysis was done using chi-square test to determine association between outcome variables and predictors of HIV, HBV, HCV and syphilis.

Univariate and multiple logistic regressions was used to determine the association between variables identified as significant predictors and the outcome variable. The results were presented with their 95% confidence interval and p-values.

3.19 Ethical Issue

This study received ethical approval from the Ghana Health Service Ethics committee (ID No: GHS-ERC: 03/10/15). Permission was sought from the management of the two hospitals before the study was commenced.

3.20 Informed Consent

Blood donors were duly informed about the purpose of the study. The various stages which includes an interview section, provision of blood sample for laboratory testing, the

tests to be done on the samples, the disclosure of test outcome to the donor and the use of the information gathered on the donor well explained to the understanding of the donor.

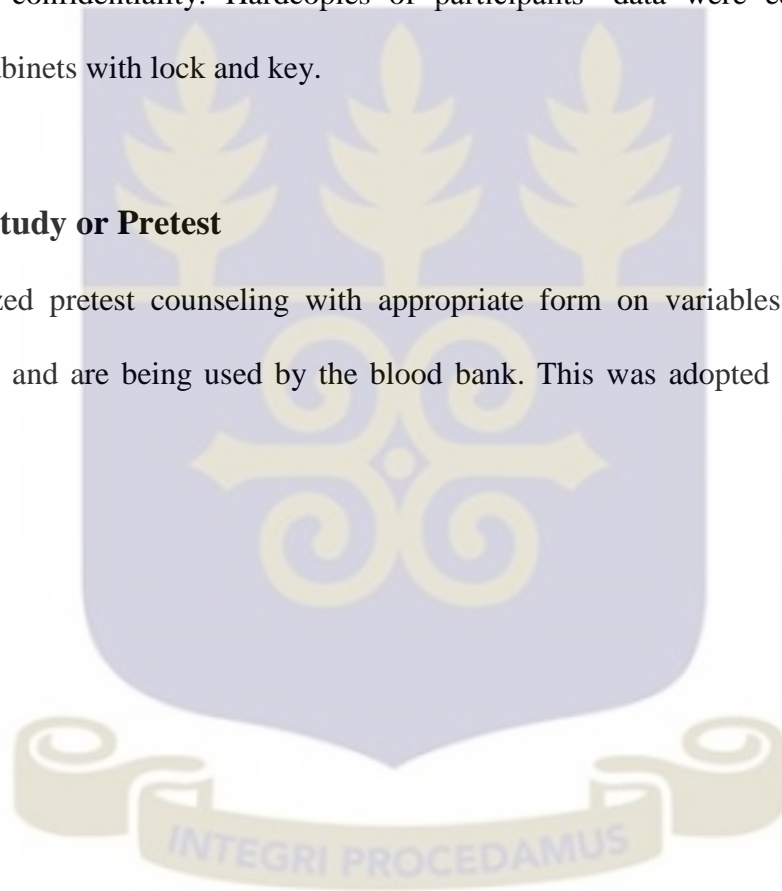
Blood donor's informed consent was obtained for the study

3.21 Confidentiality

All study documentation was kept on a computer which was password protected to ensure privacy and confidentiality. Hardcopies of participants' data were equally stored in laboratory cabinets with lock and key.

3.22 Pilot Study or Pretest

A standardized pretest counseling with appropriate form on variables to be collected already exist and are being used by the blood bank. This was adopted and used for the study.



CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of study participants

All potential blood donors visiting St Joseph hospital and Regional hospital Koforidua to donate blood during January to May, 2016 were approached to be part of the study.

A total of 426 blood donors were recruited for the study. 127 of the donors were recruited from St Joseph hospital and the remaining 299 blood donors were from Regional hospital Koforidua. The minimum age of study participants was 17 years and maximum was 54 years. The median age was 23years.

Table 1 shows demographic characteristics of study participants. Majority, (85.7% (365/426)) were males. About half (50.1%) of the donors were within the age group 20 - 29 years and 59.1% of the total blood donors had secondary education. Majority, 72.1% of the donors reside in New Juaben municipality. Family/replacement donors were the majority (52.0%) followed by Voluntary donors (26.5%) and 20.7% were Commercial donors.



Table 1: Demographic characteristics of blood donors, Koforidua, 2016

Variable	Frequency	%
Sex		
Female	61	14.3
Male	365	85.7
Age Category		
< 20	111	26.1
20-29	216	50.7
30-39	65	15.3
≥ 40	34	8.0
Marital status		
Married	93	21.8
Single	322	75.6
Widowed	1	0.2
Other	10	2.4
Religion		
Christianity	402	94.4
Islam	18	4.2
Other	6	1.4
Education		
Tertiary	100	23.5
Secondary	252	59.1
Primary	68	16.0
None	6	1.4
Occupation		
Farmer	148	34.7
Student	214	50.2
Trader	25	5.9
Artisan	39	9.2
Location / Residence		
New Juaben	307	72.07
Akuapim North	21	4.93
Kwahu West	30	7.04
Others	68	15.96
Category of donor		
Voluntary donor	113	26.5
Replacement / Family donor	225	52.8
Commercial donor	88	20.7
Smoking		
No	418	98.1
Yes	8	1.9
Alcohol use		
No	308	72.3
Yes	118	27.7
Condom use		
No	257	60.3
Yes	169	39.7
Multiple sex partners		
No	415	97.4
Yes	11	2.6

4.2 Prevalence of HIV, HBV, HCV and Syphilis among blood donors

Table 2 shows there prevalence of HIV, HBV, HCV and Syphilis infections among blood donors. The study found 4.5% (19/426) prevalence of HIV, 13.2% (56/426) prevalence of HBV, 8.0% (34/426) prevalence of HCV and 15.3% (65/426) prevalence of syphilis among blood donors in the study area.

Table 2: Prevalence of HIV, HBV, HCV and Syphilis among blood donors, Koforidua, 2016

Type of infection	Prevalence n (%)			(95% C I)
	Female n (%)	Male n (%)	Overall n (%)	
HIV	5 (8.20)	14 (3.85)	19 (4.47)	(2.86 – 6.91)
HBV	1 (1.64)	55 (15.11)	56 (13.18)	(10.26 – 16.75)
HCV	2 (3.28)	32 (8.79)	34 (8.00)	(5.76 – 11.00)
Syphilis	7 (11.48)	58 (15.93)	65 (15.29)	(12.16 – 19.05)

4.3 Prevalence of HIV, HBV, HCV and syphilis infections among blood donors by hospitals.

In St. Joseph hospital, 127 blood donors were recruited for the study of which 11.0% (14/127) were females and 89.0% (113/127) were males. The study found 3.1% (4/127) prevalence of HIV among blood donors who visited St Joseph hospital, 8.7% (11/127) prevalence of HBV among blood donors who visited St. Joseph hospital, 7.9% (10/127) prevalence of HCV among blood donors who visited St. Joseph hospital and 4.7% (6/127) prevalence of syphilis among blood donors who visited St. Joseph hospital.

Table 3 below shows the prevalence of HIV, HBV, HCV and syphilis infections in St. Joseph Hospital.

Table 3: Prevalence of HIV, HBV, HCV and syphilis infections among blood donors at St. Joseph Hospital.

Type of infection	Prevalence n (%)
HIV	4 (3.14)
HBV	11 (8.66)
HCV	10 (7.87)
Syphilis	6 (4.72)

The study found 14.3% (2/14) prevalence of HIV among female blood donors who visited St Joseph hospital and 1.8% (2/113) prevalence among male counterparts. Prevalence of HBV, HCV and syphilis among female blood donors who visited St. Joseph hospital was found to be 0.0%. Prevalence of HBV, HCV and syphilis among male blood donors who visited St. Joseph hospital was found to be 9.7% (11/113), 8.8% (10/113) and 5.3% (6/113) respectively for HBV, HCV and syphilis infections.

Table 4 shows the prevalence of HIV, HBV, HCV and syphilis infections in St. Joseph Hospital.

Table 4: Prevalence of HIV, HBV, HCV and syphilis infections among blood donors at St. Joseph Hospital by sex.

Type of infection	Prevalence n (%)		
	Female n (%)	Male n (%)	Overall n (%)
HIV	2 (14.28)	2 (1.76)	4 (3.14)
HBV	0 (0.00)	11 (9.73)	11 (8.66)
HCV	0 (0.00)	10 (8.84)	10 (7.87)
Syphilis	0 (0.00)	6 (5.30)	6 (4.72)

In Regional hospital Koforidua, a total of 299 blood donors were recruited for the study. 15.7% (47/299) of the blood donors in the study were females and 84.3% (252/299) were males. The study found 5.0% (15/299) prevalence of HIV among blood donors who visited RHK, 15.0% (45/299) prevalence of HBV among blood donors who visited RHK, 8.0% (24/299) prevalence of HCV among blood donors who visited RHK and 19.7% (59/299) prevalence of syphilis among blood donors who visited RHK.

Table 5 below shows the prevalence of HIV, HBV, HCV and syphilis infections in RHK.

Table 5: prevalence of HIV, HBV, HCV and syphilis infections among blood donors in RHK.

Type of infection	Prevalence n (%)
HIV	15 (5.01)
HBV	45 (15.05)
HCV	24 (8.02)
Syphilis	59 (19.73)

The study found 6.4% (3/47) prevalence of HIV among female blood donors who visited RHK and 4.8% (12/252) prevalence among male counterparts.

Prevalence of HBV, HCV and syphilis among female blood donors who visited RHK was found to be 2.1% (1/47), 4.3% (2/47) and 14.9% (7/47) respectively. Prevalence of HBV, HCV and syphilis among male blood donors who visited RHK was found to be 17.5% (44/252), 8.7% (22/252) and 20.6% (52/252) respectively for HBV, HCV and syphilis infections

Table 6 shows the prevalence of HIV, HBV, HCV and syphilis infections in St. Joseph Hospital.

Table 6: Prevalence of HIV, HBV, HCV and syphilis infections among blood donors at RHK by sex.

Type of infection	Prevalence n (%)		
	Female n (%)	Male n (%)	Overall n (%)
HIV	3 (6.38)	12 (4.76)	15 (5.01)
HBV	1 (2.12)	44 (17.46)	45 (15.05)
HCV	2 (4.25)	22 (8.73)	24 (8.02)
Syphilis	7 (14.89)	52 (20.63)	59 (19.73)

4.4 Socio-demographic and behavioral factors and HIV infections.

Table 7 shows the relationship between socio-demographic and behavioral factors and HIV infections.

In a chi-square test of significance, the study found marital status ($p < 0.001$), education ($p = 0.02$), category of donor ($p = 0.02$) and use or non-use of condom during sexual intercourse ($p < 0.001$) to be significantly associated with HIV infections in table 7.



Table 7: Socio-demographic and behavioral factors and HIV infections among blood donors, Koforidua, 2016

Variable	HIV Infections		p-value
	Non-Reactive n (%)	Reactive n (%)	
Sex			
Female	56 (91.80)	5 (8.20)	0.13
Male	350 (96.15)	14 (3.85)	
Age Category			
< 20	110 (99.10)	1 (0.90)	0.21
20-29	204 (94.44)	12 (5.56)	
30-39	60 (93.75)	4 (6.25)	
≥ 40	32 (94.12)	2 (5.88)	
Marital status			
Married	88 (95.65)	4 (4.35)	<0.001
Single	311 (96.58)	11 (3.42)	
Widowed	0 (0.00)	1 (100.00)	
Other	7 (70.0)	3 (30.00)	
Religion			
Christianity	383 (95.51)	18 (4.49)	0.23
Islam	18 (100.00)	0 (0.00)	
Other	5 (83.33)	1 (16.67)	
Education			
Tertiary	95 (95.00)	5 (5.00)	0.02
Secondary	245 (97.61)	6 (2.39)	
Primary	61 (89.71)	7 (10.29)	
None	5 (83.33)	1 (16.64)	
Occupation			
Farmer	137 (93.20)	10 (6.80)	0.40
Student	207 (96.73)	7 (3.27)	
Trader	24 (96.00)	1 (4.00)	
Artisan	38 (97.44)	1 (2.56)	
Location/ Residence			
New Juaben	294 (95.77)	13 (4.23)	0.42
Akuapim North	20 (95.24)	1 (4.76)	
Kwahu West	30 (100.00)	0 (0.00)	
Other	62 (95.53)	5 (7.46)	
Category of Donor			
Voluntary	112 (99.12)	1 (0.88)	0.02
Replacement/Family	208 (92.86)	16 (7.14)	
Commercial	86 (97.73)	2 (2.27)	
Smoking			
No	398 (95.44)	19 (4.56)	0.54
Yes	8 (100.00)	0 (0.00)	
Alcohol use			
No	297 (96.43)	11 (3.57)	0.15
Yes	109 (93.16)	8 (6.84)	
Condom use			
No	251 (97.67)	6 (2.33)	0.01
Yes	155 (92.26)	13 (7.74)	
Multiple sex partners			
No	396 (95.65)	18 (4.35)	0.45
Yes	10 (90.91)	1 (9.09)	

Table 8 shows the relationship between socio-demographic and behavioral factors and HBV infections. In a chi-square test of significance, the study found sex ($p=0.01$) and alcohol use ($p=0.01$) to be significantly associated with HBV infections.



Table 8: Socio-demographic and behavioral factors and HBV infections among blood donors, Koforidua, 2016

Variable	HBV Infections		p-value
	Non-Reactive n (%)	Reactive n (%)	
Sex			
Female	60 (98.36)	1 (1.64)	0.01
Male	309 (84.89)	55 (15.11)	
Age Category			
< 20	98 (88.29)	13 (11.71)	0.91
20-29	185 (85.65)	31 (14.35)	
30-39	56 (87.50)	8 (12.5)	
≥ 40	30 (88.24)	4 (11.73)	
Marital status			
Married	80 (86.96)	12 (13.04)	0.44
Single	281 (87.27)	41 (12.73)	
Widowed	1 (100.00)	0 (0.00)	
Other	7 (70.00)	3 (30.00)	
Religion			
Christianity	350 (87.28)	51 (12.72)	0.11
Islam	13 (72.22)	5 (27.8.78)	
Other	6 (100.00)	0 (0.00)	
Education			
Tertiary	86(86.00)	14 (14.00)	0.51
Secondary	220 (87.65)	31 (12.35)	
Primary	59 (86.76)	9 (13.24)	
None	4 (66.67)	2 (33.33)	
Occupation			
Farmer	125 (85.03)	22 (14.97)	0.44
Student	185 (86.45)	29 (13.55)	
Trader	22 (88.00)	3 (12.00)	
Artisan	37 (94.87)	2 (5.13)	
Location/ Residence			
New Juaben	266 (86.64)	41 (13.36)	0.96
Akuapim North	18 (85.71)	3 (14.29)	
Kwahu West	27 (90.00)	3 (10.00)	
Others	58 (86.57)	9 (13.43)	
Category of Donor			
Voluntary	99 (87.61)	14 (12.39)	0.96
Replacement/Family	194 (86.61)	30 (13.39)	
Commercial	76 (86.36)	12 (13.64)	
Smoking			
No	361 (86.57)	56 (13.43)	0.27
Yes	8 (100.00)	0 (0.00)	
Alcohol use			
No	277 (89.94)	31 (10.06)	0.01
Yes	92 (78.63)	25 (21.37)	
Condom use			
No	222 (86.38)	35 (13.62)	0.74
Yes	147 (87.50)	21 (12.50)	
Multiple sex partners			
No	360 (86.96)	54 (13.04)	0.62
Yes	9 (81.82)	2 (18.18)	

Table 9 shows the relationship between socio-demographic and behavioral factors and HCV infections as below. In a chi-square test of significance the study found that there were association between socio-demographic, behavioral factors and HCV. These associations were however not significant



Table 9: Socio-demographic and behavioral factors and HCV infections among blood donors, Koforidua, 2016

Variable	HCV Infections		p-value
	Non-Reactive n (%)	Reactive n (%)	
Sex			
Female	59 (96.72)	2 (3.28)	0.14
Male	332 (91.21)	32 (8.79)	
Age Category			
< 20	105 (94.59)	6 (5.41)	0.16
20-29	193 (89.35)	23 (10.65)	
30-39	62 (96.88)	2 (3.13)	
≥ 40	31 (91.18)	3 (8.82)	
Marital status			
Married	85 (92.39)	7 (7.61)	0.79
Single	295 (91.61)	27 (8.39)	
Widowed	1 (100.00)	0 (0.00)	
Other	10 (100.00)	0 (0.00)	
Religion			
Christianity	370 (92.27)	31 (7.73)	0.30
Islam	15 (83.33)	3 (16.67)	
Other	6 (100.00)	0 (0.00)	
Education			
Tertiary	96 (96.00)	4 (4.00)	0.24
Secondary	229 (91.24)	22 (8.76)	
Primary	60 (88.24)	8 (11.76)	
None	6 (100.00)	0 (0.00)	
Occupation			
Farmer	131 (89.12)	16 (10.88)	0.28
Student	198 (92.52)	16 (7.48)	
Trader	24 (96.00)	1 (4.00)	
Artisan	38 (97.44)	1 (2.56)	
Location/ Residence			
New Juaben	281 (91.53)	26 (8.47)	0.42
Akuapim North	19 (90.48)	2 (9.52)	
Kwahu West	30 (100.00)	0 (0.00)	
Others	61 (91.04)	6 (8.96)	
Location/ Residence			
New Juaben	281 (91.53)	26 (8.47)	0.42
Akuapim North	19 (90.48)	2 (9.52)	
Kwahu West	30 (100.00)	0 (0.00)	
Others	61 (91.04)	6 (8.96)	
Category of Donor			
Voluntary	109 (96.46)	4 (3.54)	0.12
Replacement/Family	202 (90.18)	22 (9.82)	
Commercial	80 (90.91)	8 (9.09)	
Smoking			
No	383 (91.85)	34 (8.15)	0.40
Yes	8 (100.00)	0 (0.00)	
Alcohol use			
No	287 (93.18)	21 (6.82)	0.15
Yes	104 (88.89)	11 (11.11)	
Condom use			
No	234 (91.05)	23 (8.95)	0.37
Yes	157 (93.45)	11 (6.55)	
Multiple sex partners			
No	381 (92.03)	33 (7.97)	0.89
Yes	10 (90.91)	1 (9.09)	

Tables 10a and 10b shows the relationship between socio-demographic and behavioral factors and Syphilis infections.

In a chi-square test of significance, the study found marital status ($p < 0.01$), occupation ($p < 0.001$), residence ($p < 0.001$) category of donor ($p < 0.001$) to be significantly associated with syphilis infections among blood donors

Table 10a: Socio-demographic and behavioral factors and Syphilis infections among blood donors, Koforidua, 2016

Variable	Syphilis Infections		p-value
	Non-Reactive n (%)	Reactive n (%)	
Sex			
Female	54 (88.52)	7 (11.48)	0.37
Male	306 (84.07)	58 (15.93)	
Age Category			
< 20	99 (89.19)	12 (10.81)	0.09
20-29	185 (85.65)	31 (14.35)	
30-39	51 (79.69)	13 (20.31)	
≥ 40	25 (73.53)	9 (26.47)	
Marital status			
Married	69 (75.00)	23 (25.00)	0.01
Single	283 (87.89)	39 (12.11)	
Widowed	1 (100.00)	0 (0.00)	
Other	7 (70.00)	3 (30.00)	
Religion			
Christianity	343 (85.54)	58 (14.46)	0.14
Islam	13 (72.22)	5 (27.78)	
Other	4 (66.67)	2 (33.33)	
Education			
Tertiary	90 (90.00)	10 (10.00)	0.06
Secondary	214 (85.26)	37 (14.74)	
Primary	52 (76.47)	16 (23.53)	
None	4 (66.67)	2 (33.33)	
Occupation			
Farmer	110 (74.83)	37 (25.17)	<0.001
Student	196 (91.59)	18 (8.41)	
Trader	18 (72.00)	7 (28.00)	
Artisan	36 (92.31)	3 (7.69)	

Table 10b Socio-demographic and behavioral factors and Syphilis infections among blood donors, Koforidua, 2016

Variable	Syphilis Infections		p-value
	Non-Reactive n (%)	Reactive n (%)	
New Juaben	267 (86.97)	40 (13.03)	<0.001
Akuapim North	11 (52.38)	10 (47.62)	
Kwahu West	26 (86.67)	4 (13.33)	
Others	56 (83.58)	11 (16.42)	
Category of Donor			
Voluntary	107 (94.69)	6 (5.13)	<0.001
Replacement/Family	172 (76.79)	52 (23.21)	
Commercial	81 (92.05)	7 (7.95)	
Smoking			
No	352 (84.41)	65 (15.59)	0.23
Yes	8 (100.00)	0 (0.00)	
Alcohol use			
No	267 (86.69)	41 (13.31)	0.07
Yes	93 (79.49)	24 (20.51)	
Condom use			
No	221 (85.99)	36 (14.01)	0.36
Yes	139 (82.74)	29 (17.26)	
Multiple sex partners			
No	352 (85.02)	62 (14.98)	0.26
Yes	8 (72.73)	3 (27.27)	



In table 11 as shown below, univariate analysis, marital status ($p=0.02$), category of donor ($p=0.01$) and condom use ($p=0.01$) were significantly associated with HIV infections. Sex was not seen to be significantly associated with HIV infection in the univariate analysis. However in multiple logistic regression, male sex ($p=0.02$) was associated with HIV infections among blood donors. The odds of a male donor having HIV infections was decreased by almost 90% compared to female blood donors [AOR=0.1; 95% CI (0.02 - 0.77)]

Univariate and multiple logistic regressions of socio-demographic and behavioral factors and HIV infections are shown in table 11 among blood donors.

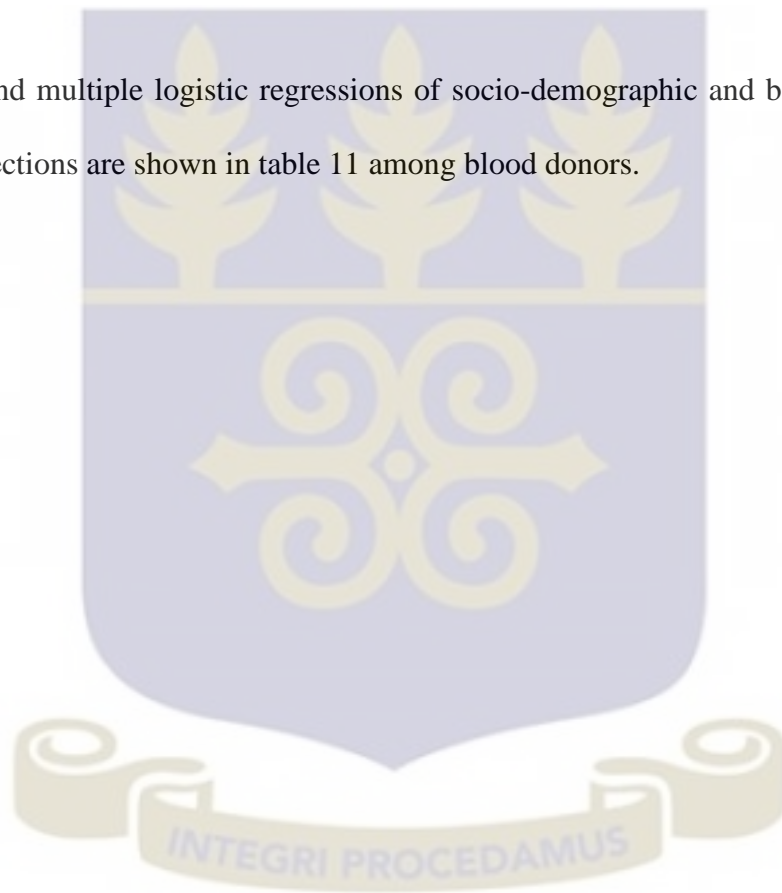


Table 11: Socio-demographic and behavioral factors and HIV infections, Koforidua, 2016

Variable	OR (CI)	p-Value	AOR (CI)	p-value
Sex		0.16		
Female	1.0		1.0	
Male	0.4 (0.16 - 1.29)		0.1 (0.02 - 0.77)	0.02
Age category		0.11		
< 20	1.0		1.0	
20-29	6.5 (0.83 - 50.42)		1.9 (0.18 - 20.76)	0.59
30-39	7.3 (0.80 - 67.10)		2.4 (0.14 - 44.47)	0.53
≥ 40	6.9 (0.60 - 78.29)		0.4 (0.01 - 15.07)	0.64
Marital Status		0.02		
Married	1.0		1.0	
Single	0.8 (0.24 - 2.50)		0.9 (0.19 - 5.01)	0.99
Widowed	-		-	-
Other	9.4 (1.75 - 50.75)		3.0 (0.33 - 28.09)	0.32
Religion		0.27		
Christianity	1.0		1.0	
Islam	-		-	-
Other	4.3 (0.47 - 38.35)		1.2 (0.07 - 18.88)	0.89
Education		0.04		
Tertiary	1.0		1.0	
Secondary	0.5 (0.14 - 1.56)		0.6 (0.12 - 3.12)	0.57
Primary	2.2 (0.66 - 7.18)		3.0 (0.37 - 24.74)	0.29
None	3.8 (0.37 - 38.97)		-	-
Occupation		0.42		
Farmer	1.0		1.0	
Student	0.5 (0.17 - 1.25)		1.9 (0.31 - 12.59)	0.47
Trader	0.6 (0.07 - 4.67)		-	-
Artisan	0.4 (0.04 - 2.91)		0.4 (0.33 - 6.40)	0.56
Residence		0.57		
New Juaben	1.0		1.0	
Akuapim North	1.1 (0.14 - 9.08)		0.3 (0.03 - 4.35)	0.45
Kwahu West	-		-	-
Others	1.8 (0.63 - 5.30)		1.7 (0.48 - 6.62)	0.38
Category of donor		0.01		
Voluntary	1.0		1.0	
Replacement/Family	8.6 (1.13 - 65.82)		11.1 (0.97 - 128.03)	0.05
Commercial	2.6 (0.23 - 29.20)		3.6 (0.21 - 60.96)	0.37
Alcohol use		0.16		
No	1.0		1.0	
Yes	1.98 (0.78 - 5.06)		1.8 (0.49 - 6.55)	0.37
Condom use		0.01		
No	1.0		1.0	
Yes	3.5 (1.31 - 9.42)		3.2 (0.92 - 11.41)	0.07
Multiple sex partners		0.51		
No	1.0		1.0	
Yes	2.2 (0.27 - 18.13)		2.3 (0.22 - 24.21)	0.48

In univariate logistic analysis, sex ($p=0.01$) and alcohol use ($p=0.01$) were significantly associated with HBV infections. Again with multiple logistic regressions, male sex (0.02) was associated with HBV infections. The odds of a male having HBV infections is increased 12.6 times compared to female blood donors. [AOR=12.6; 95% CI (1.6 - 100.4)] Alcohol use ($p=0.01$) was associated with HBV infections among blood donors. The odds of alcohol users having HBV infections is increased by more than 3.1 times compared to no alcohol use among blood donors [AOR=3.1; 95% CI (1.5 - 6.5)]

Univariate and multiple logistic regressions of socio-demographic and behavioral factors and HBV infections are shown in table 12 among blood donors.

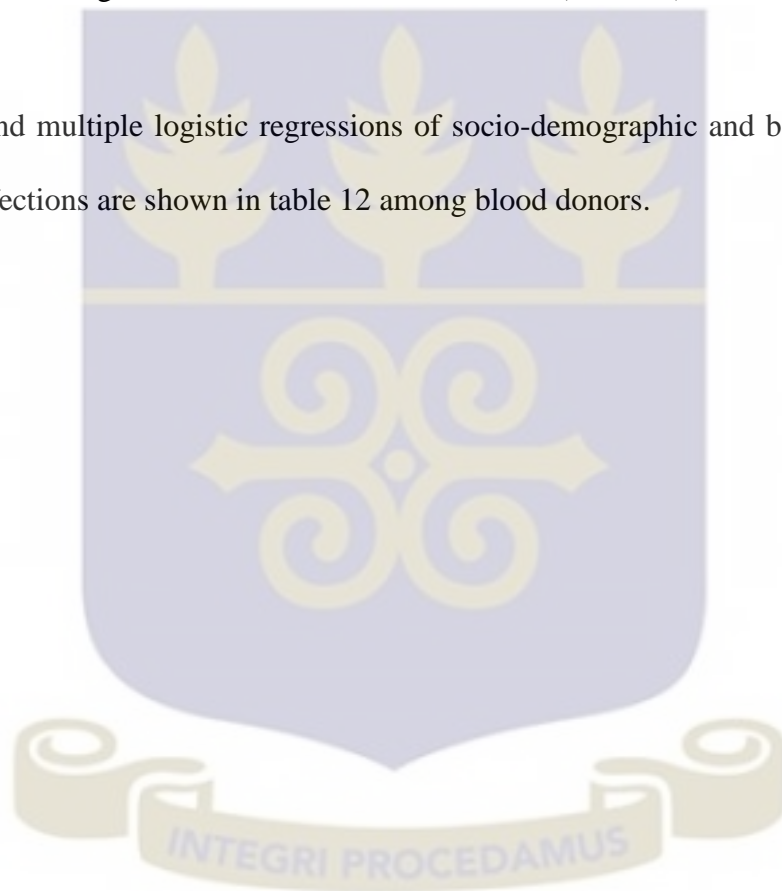


Table 12: Socio-demographic and behavioral factors and HBV infections, Koforidua, 2016

Variable	OR (CI)	p-Value	AOR (CI)	p-value
Sex		0.001		
Female	1.0		1.0	
Male	10.7 (1.45 - 78.67)		12.6 (1.59 - 100.38)	0.02
Age category		0.91		
< 20	1.0		1.0	
20-29	1.3 (0.63 - 2.52)		1.0 (0.42 - 2.61)	0.92
30-39	1.1 (0.42 - 2.76)		0.6 (0.14 - 2.85)	0.57
≥ 40	1.0 (0.30 - 3.31)		0.8 (0.13 - 4.91)	0.82
Marital Status		0.37		
Married	1.0		1.0	
Single	0.97 (0.49 - 1.94)		0.8 (0.25 - 2.60)	0.72
Widowed	-		-	-
Other	2.9 (0.65 - 12.58)		3.5 (0.55 - 22.54)	0.18
Religion		0.10		
Christianity	1.0		1.0	
Islam	2.6 (0.90 - 7.71)		2.6 (0.71 - 9.77)	0.15
Other	-		-	-
Education		0.61		
Tertiary	1.0		1.0	
Secondary	0.9 (0.49 - 1.62)		0.8 (0.36 - 2.03)	0.74
Primary	0.8 (0.21 - 2.81)		0.6 (0.18 - 2.48)	0.57
None	0.3 (0.07 - 1.34)		2.1 (0.19 - 23.61)	0.53
Occupation		0.36		
Farmer	1.0		1.0	
Student	0.9 (0.49 - 1.62)		1.1 (0.40 - 3.06)	0.84
Trader	0.8 (0.21 - 2.81)		1.0 (0.24 - 4.46)	0.95
Artisan	0.3 (0.07 - 1.37)		0.2 (0.04 - 1.42)	0.12
Residence		0.96		
New Juaben	1.0		1.0	
Akuapim North	1.1 (0.30 - 3.83)		0.9 (0.22 - 3.95)	0.95
Kwahu West	0.7 (0.21 - 2.48)		1.4 (0.33 - 6.22)	0.62
Others	1.0 (0.46 - 2.18)		1.4 (0.58 - 3.44)	0.44
Category of donor		0.96		
Voluntary	1.0		1.0	
Replacement/Family	1.1 (0.55 - 2.16)		0.6 (0.24 - 1.58)	0.32
Commercial	1.1 (0.49 - 2.55)		0.4 (0.18 - 1.32)	0.16
Alcohol use		0.00		
No	1.0		1.0	
Yes	2.4 (1.36 - 4.32)		3.1 (1.52 - 6.54)	<0.001
Condom use		0.74		
No	1.0		1.0	
Yes	0.9 (0.51 - 1.62)		0.6 (0.32 - 1.24)	0.18
Multiple sex partners		0.63		
No	1.0		1.0	
Yes	1.5 (0.31 - 7.04)		1.6 (0.28 - 9.73)	0.58

In multiple logistic regression, religion ($p=0.04$) was associated with HCV infections among blood donors. The odds of a Muslim blood donor having HCV infections is increased 4.5 times compared to Christian blood donors [AOR=4.5; 95% CI (1.04 - 20.08)] Secondary education ($p=0.04$) was associated with HCV infections among blood donors. The odds of secondary school HBV infections is increased 3.6 times compared to tertiary education among blood donors [AOR=3.6; 95% CI (1.04 - 13.06)]

Univariate and multiple logistic regressions of socio-demographic and behavioral factors and HCV infections are shown in table 13 among blood donors.

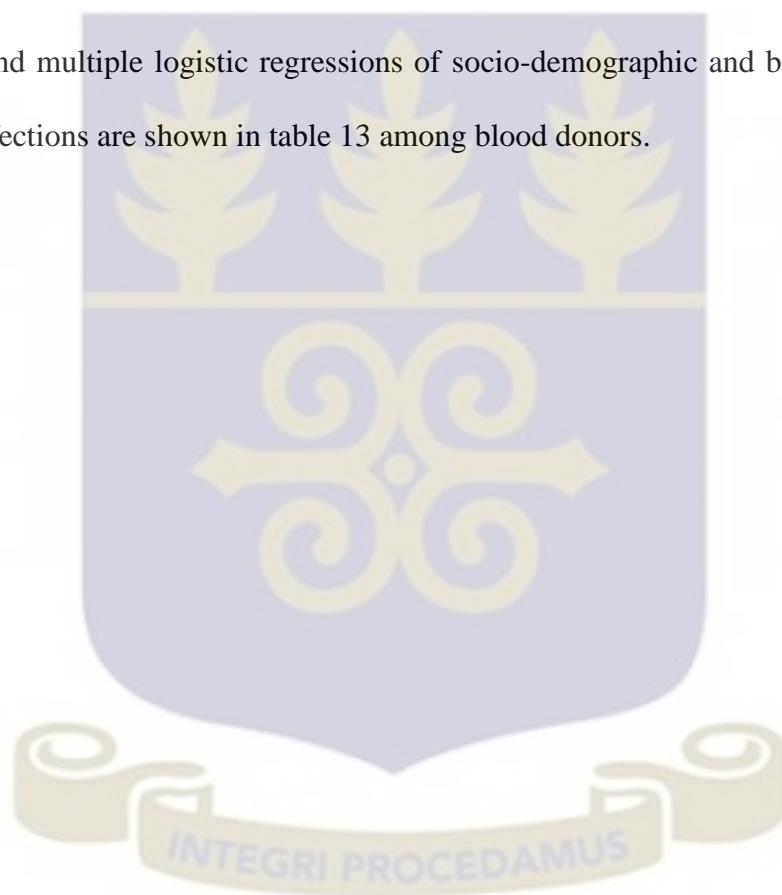


Table 13: Socio-demographic and behavioral factors and HCV infections, Koforidua, 2016

Variable	OR (CI)	p-Value	AOR (CI)	p-value
Sex		0.10		
Female	1.0		1.0	
Male	2.8 (0.66 - 12.18)		1.4 (0.29 - 6.92)	0.66
Age category		0.13		
< 20	1.0		1.0	
20-29	2.1 (0.82 - 5.28)		2.7 (0.88 - 8.60)	0.08
30-39	0.6 (0.11 - 2.88)		0.5 (0.06 - 4.94)	0.62
≥ 40	1.7 (0.40 - 7.17)		1.9 (0.22 - 15.97)	0.55
Religion		0.23		
Christianity	1.0		1.0	
Islam	2.4 (0.66 - 8.69)		4.5 (1.04 - 20.08)	0.04
Other	-		-	-
Education		0.14		
Tertiary	1.0		1.0	
Secondary	2.3 (0.77 - 6.87)		3.6 (1.04 - 13.06)	0.04
Primary	3.2 (0.92 - 11.10)		4.9 (0.93 - 25.78)	0.06
None	-		-	-
Occupation		0.23		
Farmer	1.0		1.0	
Student	0.7 (0.32 - 1.37)		1.6 (0.54 - 5.06)	0.37
Trader	0.3 (0.04 - 2.69)		0.2 (0.03 - 2.67)	0.27
Artisan	0.2 (0.03 - 1.68)		0.3 (0.04 - 3.55)	0.40
Residence				
New Juaben	1.0		1.0	
Akuapim North	1.1 (0.25 - 5.15)		0.5 (0.09 - 3.17)	0.51
Kwahu West	-		-	-
Others	1.1 (0.41 - 2.69)		1.0 (0.36 - 2.89)	0.96
Category of donor		0.09		
Voluntary	1.0		1.0	
Replacement/Family	3.0 (0.9 - 8.8)		1.9 (0.56 - 6.98)	0.28
Commercial	2.7 (0.7 - 9.3)		1.1 (0.30 - 4.42)	0.83
Alcohol use		0.16		
No	1.0		1.0	
Yes	1.7 (0.83 - 3.53)		2.0 (0.84 - 4.92)	0.12
Condom use		0.37		
No	1.0		1.0	
Yes	0.7 (0.34 - 1.50)		0.5 (0.23 - 1.24)	0.15
Multiple sex partners		0.89		
No	1.0		1.0	
Yes	1.2 (0.14 - 9.29)		1.7 (0.16 - 17.58)	0.65

In univariate analysis, marital status ($p=0.01$), occupation ($p<0.001$) residence ($p<0.001$) and category of donor ($p<0.001$) were significantly associated with Syphilis infections. However with multiple logistic regression, occupation ($p=0.02$) was significantly associated with syphilis infections among blood donors. The odds of syphilis infections among blood donors who are students is 0.3 times lower compared to blood donors who are farmers.[AOR=0.3; 95% CI (0.11 - 0.83)]. Residence ($p=0.01$) was associated with syphilis infections among blood donors. The odds of syphilis infections among blood donors who live in Akuapim North is increased by 4.5 times compared to the odds among blood donors who live in New Juaben municipality [AOR=4.5; 95% CI (1.59 - 12.89)]. Category of donor ($p=0.02$) was associated with syphilis infections among blood donors. The odds of syphilis infections among family replacement donors is 4.4 times higher compared to the odds among voluntary blood donors [AOR=4.4; 95% CI (1.29 - 15.68)]

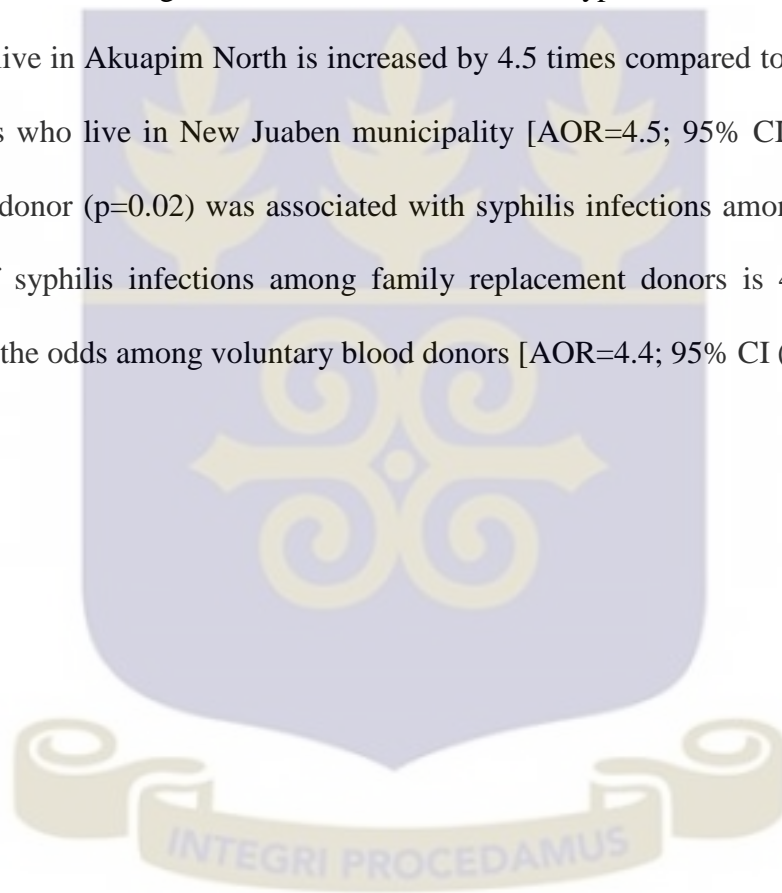


Table 14: Socio-demographic and behavioral factors and Syphilis infections, Koforidua, 2016

Variable	OR (CI)	p-Value	AOR (CI)	p-value
Sex		0.36		
Female	1.0		1.0	
Male	1.5 (0.63 - 3.37)		1.0 (0.39 - 3.00)	0.87
Age category		0.11		
< 20	1.0		1.0	
20-29	1.4 (0.67 - 2.81)		0.5 (0.19 - 1.50)	0.24
30-39	2.1 (0.89 - 4.94)		0.2 (0.07 - 1.19)	0.09
≥ 40	2.9 (1.12 - 7.82)		0.5 (0.10 - 2.52)	0.41
Marital Status		0.01		
Married	1.0		1.0	
Single	0.4 (0.23 - 0.73)		0.6 (0.25 - 1.75)	0.41
Widowed	-		-	-
Other	1.3 (0.30 - 5.38)		1.5 (0.30 - 7.57)	0.62
Religion		0.20		
Christianity	1.0		1.0	
Islam	2.2 (0.78 - 6.62)		1.7 (0.51 - 5.84)	0.38
Other	2.9 (0.53 - 16.51)		1.2 (0.17 - 8.76)	0.83
Education		0.08		
Tertiary	1.0		1.0	
Secondary	1.6 (0.74 - 3.26)		0.9 (0.35 - 2.30)	0.84
Primary	2.8 (1.17 - 6.54)		0.4 (0.14 - 1.49)	0.20
None	4.5 (0.73 - 27.73)		0.9 (0.10 - 8.45)	1.00
Occupation		0.001		
Farmer	1.0		1.0	
Student	0.2 (0.14 - 0.50)		0.3 (0.11 - 0.83)	0.02
Trader	1.1 (0.44 - 2.98)		0.9 (0.33 - 2.93)	0.99
Artisan	0.2 (0.07 - 0.85)		0.2 (0.06 - 1.09)	0.07
Residence		0.001		
New Juaben	1.0		1.0	
Akuapim North	6.1 (2.42 - 15.20)		4.5 (1.59 - 2.89)	0.01
Kwahu West	1.0 (0.34 - 3.09)		3.4 (0.78 - 5.43)	0.10
Others	1.3 (0.63 - 2.71)		1.2 (0.54 - 2.75)	0.63
Category of donor		0.001		
Voluntary	1.0		1.0	
Replacement/Family	5.4 (2.23 - 12.98)		4.4 (1.29 - 5.68)	0.02
Commercial	1.5 (0.49 - 4.76)		1.6 (0.40 - 6.57)	0.49
Alcohol use		0.07		
No	1.0		1.0	
Yes	1.7 (0.96 - 2.93)		1.1 (0.56 - 2.20)	0.75
Condom use		0.36		
No	1.0		1.0	
Yes	1.3 (0.75 - 2.18)		1.0 (0.54 - 1.96)	0.91
Multiple sex partners		0.30		
No	1.0		1.0	
Yes	2.1 (0.55 - 8.24)		1.9 (0.39 - 9.40)	0.42

Table 15 shows co-infections of HIV, HBV, HCV and syphilis among blood donors.

The study found the prevalence of co-infections among blood donors to be 2.4% (10/426).

The commonest co-infection was HBV-Syphilis co-infection which has 1.2% prevalence 36.2% (154/426) of the donors were positive for one (1) out of the four (4) infections screened.

Table 15: Prevalence of co-infections of HIV, HBV, HCV and Syphilis among blood donors, Koforidua, 2016

Co-infections	Frequency	Percentage (%)
HIV + HBV	0	0.00
HIV + HCV	2	0.47
HIV + Syphilis	1	0.24
HBV + HCV	0	0.00
HBV + Syphilis	5	1.17
HCV + Syphilis	2	0.47
HBV + HCV + Syphilis	0	0.00
HIV + HBV + Syphilis	0	0.00
HIV + HCV + Syphilis	0	0.00
HIV + HBV + HCV	0	0.00
Total	10	2.35

CHAPTER FIVE

DISCUSSION

In this study, majority of the study participants were males. This is always the case as far as blood donation is concerned and in similar studies earlier, males were majority of the donors. (Walana et al., 2014) and (Tessema et al., 2010) This is again because women generally have low haemoglobin levels hence are mostly disqualified as blood donors. In Africa, females are seen as a weaker sex and there is a general belief among people that blood donation is for the supposed healthy and strong. Since males are the strong in society, the responsibility to donate blood in times of need is passed on to males. Again, certain biological life cycles also naturally do not permit females to part take in blood donation. Examples are pregnancy, breastfeeding and menstruation.

Males always dominate as blood donors compared to females. This is because females usually have a history of surgery of one form or the other especially caesarian section or may have been transfused before due to the generally low haemoglobin levels in women or the need to transfuse the woman due to child birth. These also results in female numbers being reduced in the pre donation screening interview.

The study found majority of the donors were within the age range of 20-29. This is consistent with other studies (Ampofo et al., 2002). In the case of other studies, this is said to be as a result of economic benefits. This is because of the funds attached to commercial donation, people in this age category are attracted to blood donation

The study found that majority of donors reside in New Juaben Municipality. This is because the two hospitals are both located in this very municipality and is within the regional capital of eastern region with a greater population than the other districts.

More than 50% of the recruited blood donors in this study were family or replacement donors. This conforms to earlier studies by Nagalo where more than 52% of the people who showed up for blood donation in a study were family/replacement donors (Nagalo et al., 2011).

Only 8.0% of the 426 blood donors in this study were in the age category ≥ 40 years. This age category were the least in numbers among the people with respect to age who visited the hospital blood banks to donate blood. Earlier studies by other researchers in several other studies have also found out that people aged 40 years and above rarely participate in blood donation (Nagalo et al., 2011). These older donors were those who had to donate for relatives with rare blood group. For example a mother donating for her 15 year old son because the child belongs to the blood group "O" Rhesus negative and can only take that blood type from her mother who is also "O" Rhesus negative.

The marital status of the blood donors in this study reveals that 75.6% of the blood donors were people who had never married (singles).

Approximately 94% (94.4%) of the blood donors belong to the Christianity group in terms of religion. This was expected because the population of southern part of Ghana is predominantly a Christian community compared to the northern part. Koforidua the regional capital of the eastern region where the study was carried out is located within the southern part of the country. Therefore higher turnout of Christians was expected.

The study found that 59.1% of the blood donors had secondary education. This is because of the policy by blood banks to encourage students of neighbouring secondary school to donate blood to the various blood banks voluntarily. This practice is done in Malawi as well. For this reason most of our blood donors are students of secondary schools (Allain et al., 2008).

Due to the fact that the Regional hospital is a referral hospital which receives cases from all other districts within the region, there is always demand for blood by the blood bank. Unlike St. Joseph hospital, commercial donation is allowed at the regional hospital. The study recruited donors that fall within the three groups of blood donors that usually donate blood at the blood bank. Voluntary blood donation to the regional hospital was from organized groups as well as churches and second cycle institutions like New Juaben Senior High School who visited the health facility to donate blood to the blood bank.

Most of the blood donors (52.8%) were replacement donors and in other studies too replacement donors were the majority (Matee et al., 2006).

Commercial donors are people who donate blood for a fee. This category of donors was prominent at the Regional hospital. Mostly these were people less than 30 years of age, Senior High School graduates and Junior High School graduates, people in apprenticeship or artisan who went to the blood bank to donate blood for a fee. Females did not show up for commercial donation throughout the study period and commercial donation of blood is not done in St Joseph hospital.

5.1 Prevalence of HIV, HBV, HCV and Syphilis infections among blood donors, Koforidua, 2016

This study found the prevalence of HIV to be 4.5%. This is similar to the overall prevalence of 4.9% found among donors who were in Kintampo Municipality (Walana et al., 2014). Eastern region has the highest prevalence of HIV, 3.7% by region in Ghana (HIV sentinel survey report, 2014). The prevalence found in this study is not too different compared to the regional prevalence because the hospitals are located in the eastern

region. Again the regional prevalence takes into account HIV test done at all times whereas this study is restricted to only blood donors and only two of the health facilities.

The prevalence of HBV was found to be 13.2% which is higher than what has been found in an earlier study in Kathmandu as 8.8% (Shrestha et al., 2009). In a similar study carried out at the Kintampo Municipal Hospital, the prevalence of HBV was 9.6% (Walana et al., 2014).

HCV prevalence in this study was 8.0% contrary to similar studies carried out in Tanzania where the prevalence of HCV was 1.5% (Matee et al., 2006).

In the case of syphilis, a prevalence of 15.3% was recorded which is higher compared to a reported range of 4.7% to 13.5% among blood donors in Damongo, northern Ghana where secondary data was reviewed (Kubio et al., 2012). The variation in the figures could be as a result of the available data to Kubio which could mean that some of the donors were not tested for syphilis hence their status could not be known. In this study, every blood donor who was part of the study was tested for syphilis and a prevalence of 15.3% was obtained.

5.2 Prevalence of HIV, HBV, HCV and syphilis infections by sex and health facility among blood donors.

A total of 127 blood donors were recruited at St. Joseph hospital during this study and 88.9% (113/127) were males. The findings of this study also conforms accordingly regarding those who visited St. Joseph. Again this high turnout of males was expected at St. Joseph because the hospital shares boundaries with Pope John's secondary and seminary school. This institution is a boys' school. The hospital benefits from voluntary blood donation from this boys' school periodically. Therefore higher male numbers was expected compared to their female counterparts.

Study findings shows that the prevalence of the infections among blood donors ranges from 3.1% to 8.7%

HBV infections is endemic in sub-Saharan Africa and its chronic infections range between 3.0% to 22.0% among blood donors (Kubio et al., 2012). Prevalence of HBV was found to be highest of the infections screened for at St Joseph hospital. The prevalence of HBV among blood donors in St Joseph hospital was found to be 8.7%. Comparing this to the case of Walana in a recent study at Kintampo Municipal hospital, Prevalence of HBV infections among donors was found to be 9.6%. The figures can be said to be close in magnitude. No specific reason can be given for this. One probable reason here could be that because HBV infection is significantly associated with male sex (Matthews et al., 2014). Therefore with a lot of male donors visiting St Joseph hospital, a high prevalence is expected compared to the other infections.

In St Joseph hospital apart from HIV infections which has a prevalence of 14.0% among female blood donors, the prevalence of HBV, HCV and syphilis among the female blood donors was found to be 0.0%. This could be as a result of the very limited number of female donors (14) that participated in the study. Other researchers have quoted several figures either than 0.0% as the prevalence of HBV, HCV and syphilis among females. In Tanzania, a study recorded the prevalence as follows in females; HBV 6.3%, HCV 1.1% and syphilis was 4.0%

In RHK, a total of 299 blood donors were recruited for the study of which 84% (252/299) were male donors.

Syphilis prevalence was found to be 19.7% at the regional hospital among blood donors. In a study among prison inmates and officers, syphilis prevalence was found to be 16.5% and 7.9% respectively (Adjei et al., 2008).

Apart from HIV prevalence which was higher among female donors than male blood donors, the prevalence of the other infections; HBV, HCV and syphilis was higher among males than females. Generally, females are more prone to HIV infections. This might have accounted for the finding of this study. This can be said to be the reason why HIV infections at RHK were higher in females than their male counterparts.

5.3 Socio-demographic factors and HIV, HBV, HCV and Syphilis infections

This study found HIV prevalence to be highest among the age category 30 - 39 years and the least in those < 20 years. This is contrary to findings in Tanzania where it was highest in those greater than or equal to 40 years and the least being 20 to 29 years (Matee et al., 2006).

The prevalence of HIV was higher (8.2%) in females and this conforms to a study which shows 6.6% in females and 3.4% in males (Matee et al., 2006). With respect to occupation, the study found the prevalence of HIV to be 2.6% and the least found among artisan, this however does not conform to other studies done in Ethiopia which found the prevalence to be least in students (Tessema et al., 2010).

The prevalence of HBV in males was high (15.1%) and this conforms to findings by other studies which also reviewed HBV to be higher among male donors (Tessema et al., 2010).

The highest prevalence of HBV among blood donors was within the 20 - 29 years age group and the least was in those less than 20 years and greater than 40 years. This however varies from the findings of other researchers where it is highest among donors less than 20 years and decreased as the age group increased (Walana et al., 2014).

HBV prevalence was higher among farmers which is consistent with the findings of (Tessema et al., 2010).

HCV prevalence is higher in males than females and this is conforms with earlier findings (Tessema et al., 2010).

The study found HCV prevalence to be higher in the age category 20 to 29 This is contrary to other findings where the prevalence was high among donors 30 to 39 years of age and least among those less than 20 years (Walana et al., 2014). The trend as reported by Walana indicates that HCV infections increase directly proportional to increasing age. Lifestyle accounts for the higher prevalence among 20-29 years group in this study. Prevalence of HCV was found to be high among farmers and least in artisans this does not conform to earlier findings from a study in Tanzania where farmers were the most affected and construction workers were the least affected (Tessema et al., 2010).

The prevalence of syphilis infections among male donors was 15.9%. This is high compared to the prevalence in females. This is consistent with findings from Tanzania (Tessema et al., 2010). Again this study revealed that, people below 20 years were most affected by syphilis infection and this is also consistent with findings from a study in Ethopia where the most affected group was less than 25 years (Tessema et al., 2010).

5.4 Co-infections of HIV, HBV, HCV and Syphilis

All the agents have almost the same root of infections, hence this study sort to determine co infections of HIV, HBV, HCV and syphilis among blood donors. Of all the donors during the study period, 36.15% were infected with one pathogen. In a similar study recently in Burkina Faso, prevalence for single pathogen was 29.82% (Nagalo et al., 2011). The prevalence of a single pathogen infection, 36.15% as found by this study is

relatively higher. However there is no specific reason to be given as what accounts for this figure. The figures are not that wide apart and again Ghana shares boundaries with Burkina Faso where the socio-economic characteristics as well as lifestyle of these citizen are almost the same for Burkina Faso and Ghana. Both nations are developing countries as well and are endemic for HIV, HBV, HCV and syphilis infections so recording not too wide apart figures is expected.

The prevalence of multiple co-infections was found to be 2.35%. This is less in magnitude compared to earlier studies which found prevalence of co-infections to be 3.30% in Burkina Faso (Nagalo et al., 2011). Co-infections of HIV, HBV, HCV and syphilis among blood donors is normally of low prevalence (Farshadpour et al., 2016). The commonest co-infection was HBV-Syphilis infections 1.17%. There was no HIV-HBV co-infections as well as HBV-HCV co-infections. Contrary to earlier studies (Walana et al., 2014) and (Nagalo, et al., 2011). Again other studies done in sub- Sahara Africa have reported HBV-HCV pathogenic infections as the commonest (Walana et al., 2014)

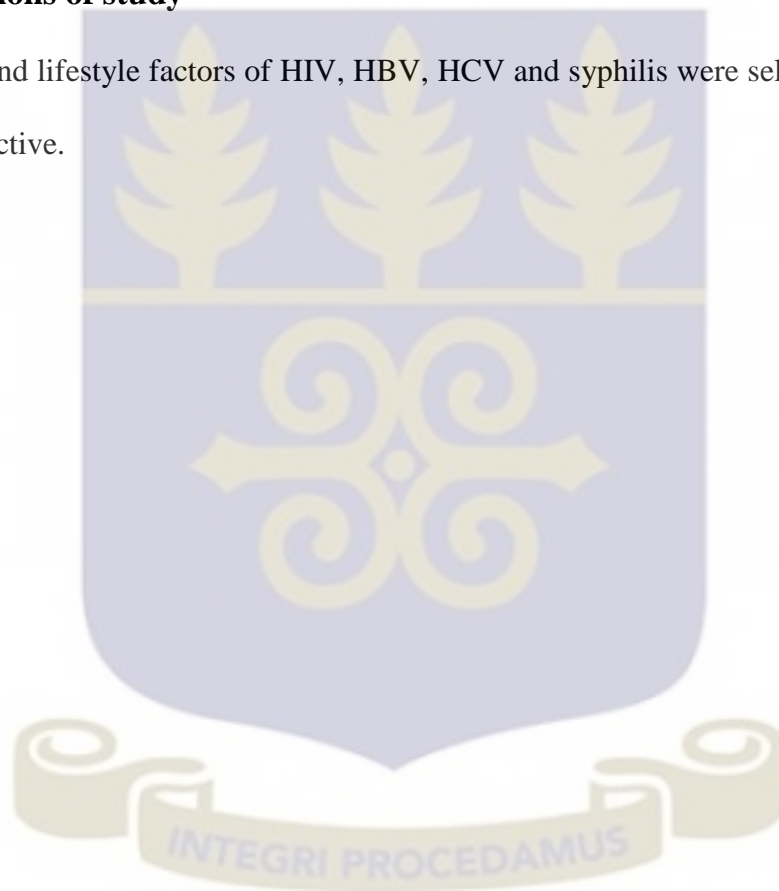
No single blood donor had triple infections of (HBV-HCV-syphilis), (HIV-HBV-syphilis), (HIV-HCV-syphilis) and (HIV-HBV-HCV) hence the prevalence for these multiple infection combinations were 0.00%. This is consistent with findings of a recent similar study in Iran where there was no co-infection of any of the pathogenic markers among the blood donors (Farshadpour et al., 2016). This is however not in agreement with the findings of early works where there were co-infections for all the pathogens in multiples with different prevalence for each of them either than 0.00% prevalence (Nagalo, et al., 2011).

There was 0.00% prevalence for the multiples of more than two co-infections as revealed by this study was expected. Even though the pathogens have very similar route of

infection as known from literature, co-infections are generally not common particularly among blood donors. Blood donors are assumed to be very healthy people (Bloch et al., 2012). To harbour three or all of these infections is possible among people with a medical condition and exhibiting symptoms as such but among blood donors is rare. This is same as this study depicts

5.5 Limitations of study

Behavioral and lifestyle factors of HIV, HBV, HCV and syphilis were self-reported which is very subjective.



CHAPTER SIX

CONCLUSION

In this study, the prevalence of HIV among blood donors in two hospitals in Koforidua was 4.47%. Hepatitis B and C prevalence respectively were found to be 13.15% and 8.00% among blood donors. Syphilis prevalence among blood donors was 15.29%.

Socio-demographic and behavioral factors found to be significantly associated with HIV, HBV, HCV and syphilis infections among blood donors in Koforidua were residence of the donor, religion, educational level, occupation, category of donor, sex and alcohol use.

The commonest co-infections among the donors was found to be HBV- syphilis which had a 1.17% prevalence.

Prevalence of multiple infection was found to be 2.35% among blood donors and 36.15% was recorded as the prevalence of either of the single infections.

6.1 Recommendations

To the two hospitals

The blood donor register should be redesigned to capture additional variables such as occupation, level of education and marital status on the demographic characteristics of blood donors.

Donor who tests reactive for any of the other infections should be referred to the public health unit for further treatment as done in the case of HIV.

To the Eastern Regional Health Directorate;

The deputy director public health should ensure that health education on syphilis and hepatitis B is intensified in the eastern region particularly Akuapim North District.



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APPENDIX

Health Questionnaire

Name.....**Date**.....

Form Number.....**ID**.....

Are you feeling well today, i.e. fever, cough, headache or cold? Yes () No()

Have you ever been deferred as a blood donor or told not to donate blood? Yes () No()

Are you undergoing any medical treatment or taking any medicine? Yes () No()

Have you had jaundice, liver disease, hepatitis or positive blood test for hepatitis?
Yes () No()

Have you ever taken any self-injected drugs or diagnosed as a drug addict?
Yes () No()

Have you in the past 12 months had an injection in a place that is not a hospital or clinic; skin scarring or tattoo or cutting by traditional healer including circumcision? Yes () No()

Have you in the past 12 months had a major operation? Yes () No()

Have you in the last 6 months received blood or blood product transfusion? Yes () No()

Have you in the last 6 months had more than one sexual partner or have paid/ been paid to have sex? Yes () No()

Have you ever had any sexually transmitted disease? Yes () No()

Have you in the last six months had sex with a homosexual or a prostitute? Yes () No()

Have you or your partner tested positive for HIV? Yes () No()

Research Questionnaire

- 1. Form Number:
- 2. Date:
- 3. ID Number:

Demographic Data

- 4. Name:
- 5. Age:
- 6. Sex:
- 7. Residential address.....
- 8. Telephone Number.....
- 9. Occupation.....
- 10. Marital status.....
- 11. Religion
- 12. Education None Primary Secondary Vocational Tertiary
- 13. Category of donor:
a) Voluntary b) Commercial c) Replacement/Family donor
- 14. Have you donated blood before: YesNo.....
- 15. If Yes how many times?

Clinical Data

- 16. Blood group.....
- 17. HIV Result: Negative.....Positive.....
- 18. HBV Result: Negative.....Positive.....

19. HCV Result: Negative.....Positive.....

20. Syphilis Result: Negative.....Positive.....

INFORMED CONSENT FORM

CONSENT TO PARTICIPATE IN A HUMAN RESEARCH PROTOCOL

Project title: HIV, HBV, HCV and syphilis infections among blood donors in Koforidua.

I..... have been invited to take part in the research HIV, HBV, HCV and syphilis infections among blood donors in Koforidua.

I have been told the purpose of the research. All blood donors will undergo pre-donation counseling on HIV, syphilis, HBV and HCV. Laboratory investigations for these various infections would be carried out on their samples.

Study participants would be required to provide answers to a couple of questions in an interview session. 5mls of blood sample would be drawn from study participants. A trained technician will insert a needle into the vein in one arm of study participants and draw some blood for testing of HIV, HBV, HCV and Syphilis. This may cause pain, discomfort or bruising at the site of the needle insertion. Donors who test positive for HIV will be referred to the Anti-Retroviral Therapy Clinic for further treatment and management. Those positive for HBV and HCV will be given treatment after baseline assessment of the liver through liver function tests and viral load before commencement of medication.

The risk or danger and discomfort:

By participating in this research any unlikely harm that may occur to study participants as a result of this research, medical care would be given in this very hospital at no cost to the blood donors. Donors would be counseled on any psychological risk and anxiety associated with knowing that one is positive for any of these infections.



Benefits:

There is a personal benefit to be derived in this particular research in the form of the status of the individual being known with respect to the infections being screened. The findings of this study would improve the health of the community at large as it would help inform policy

Confidentiality:

The information that is collected from this research is restricted to the principal investigator. A code will be assigned to donor names and the code used afterwards and not the donor names. The findings of this study will be reported at meetings, seminars and in medical journals but donor names will not be used in the reports.

Right to refuse or withdraw:

Blood donors have the right to take part in this research or not without losing any benefit. Withdrawal from this study at any time by the donor is permitted.

Contact information:

For any questions study participants may ask that now or later contact Holy Alomatu at Regional Hospital Koforidua on (0243220438), Dr Bismark Sarfo of the School of Public Health on (0269343169) and Hannah Frimpong of the Ghana Health Service Ethical Review Committee on (0507041225).

I have read the above information/ it has been read and well translated to me in my local language in the presence of a witness. Opportunity was given to ask questions about the study and all questions asked were answered to my satisfaction.

I consent voluntary to participate as a subject in this study and understand that I have the right to withdraw from the study at any time.

Signed by:

Name: Date:

Place.....

If illiterate right thumb print

Name of witness.....

.....

Signature.....

RTP

Phone No.....

Name (Donor):





PI interviewing a female study participant at RHK



Serological analysis outcome for HIV, HBV, HCV and syphilis infections in a blood donor



Blood donor being assisted to donate during the bleeding process