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FACTORS ASSOCIATED WITH HIV PREVALENCE IN SUNYANI MUNICIPALITY

BY

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DECLARATION

I, Kingsley Arhin-Wiredu, author for this thesis, hereby declare that apart from specific references which have duly been acknowledged, this research is my own independent work undertaken under the supervision of Dr. Bismark Sarfo. I further declare that no part of this thesis, either in whole or in part has been submitted elsewhere for the award of another degree**.**

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Dr. Bismark Sarfo **……..……... …….....**

(Academic Supervisor) **Signature** **Date:**

DEDICATION

This work is dedicated to God Almighty, who by His abundant grace and mercies led me through my studies. I further dedicate this thesis to the entire Arhin-Wiredu and Amankwah family.

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ABSTRACT

Background: The Brong Ahafo Region of Ghana has consistently recorded increase in HIV prevalence over the past 3 years with an average prevalence of 2.7%. Nonetheless, Sunyani the capital of the Brong Ahafo Region of Ghana recorded an HIV prevalence of 4.2% far above the National average of 2.4%. In view of that, this study sought to assess factors associated with HIV prevalence in the Sunyani municipality of Ghana.

Method: A facility based cross sectional study was conducted in three hospitals in the Sunyani from March to August 2018. A structured questionnaire was used to interview 445 clients accessing HIV counselling and testing services. Simple and Multiple logistic regression methods were used to identify factors associated with HIV prevalence.

Results: The mean age of respondents was 30.8±8.5 years. HIV prevalence per sub districts ranged from 0 to 11.9% with New Dormaa recording the highest prevalence of 11.9% (CI: 5.7-23.1). About 13 (28%) of the HIV positive clients reside in districts outside the Sunyani Municipality. Clients with previous history of syphilis have HIV prevalence 6.39 times odds of being HIV infected compared to those with vaginal or urethral discharges (aOR=6.39, 95% CI: 4.14-9.78). Clients with multiple sex partners are 3.33 more likely to be HIV infected than those with one partner. (aOR=3.33, 95% CI: 1.16-9.55).

Conclusion: The prevalence of HIV in the Sunyani Municipality was 10.3% (95% CI: 7.82-13.54) however 13(28%) of the HIV positive clients reside outside Sunyani Municipal. HIV prevalence was found to be significantly associated with previous history of STI and multiple sexual partners.

Recommendation: Ghana Health Service and partners should target and sustain effective prevention interventions such as health education and behavioral change communication. These interventions should target age-specific groups to prevent new infection across all age groups

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
CHPS	Community Based Health Planning Service
CDC	Center for Disease Control and Prevention
CD4	Cluster of Differentiation 4
CI	Confidence Interval
HIV	Human immunodeficiency virus
HSV	Herpes Simplex Virus
IQR	Interquartile Range
LISA	Local Indicators of Spatial Association
OR	Odd Ratio
PLHIV	People Living with HIV
PMTCT	Prevention of Mother to Child Transmission
STI	Sexually Transmitted Infection
TB	Tuberculosis
UNAIDS	Joint United Nations Programme on HIV/AIDS
VCT	Voluntary Counselling and Testing
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Globally, a lot of interventions have targeted to reduce exposure to HIV risk factors however HIV continues to affect millions of people. Presently, there is no known HIV vaccine or cure, however, technology has contributed its quota in transforming HIV which was previously considered as a death sentence into a chronic and manageable disease with reduced mortality rates.

As have been previously reported in literature by the World Health Organization, (2016) and the Centers for Disease Control and Prevention (2015), having sex with no protection, having oral sex with an HIV infected person; transfusion of contaminated blood; sharing needles, syringes, surgical equipment or other sharp instruments that are contaminated are factors known to transmit HIV infection. Also, HIV infections are transmissible from mother to child pregnancy and childbirth as well as during breastfeeding (WHO, 2016). The time between contact with an infected person and manifestation of signs and symptoms of HIV can vary widely between individuals (Casadevall & Pirofski, 2018; Melhuish & Lewthwaite, 2018). The period from acquiring HIV and AIDS usually spans between 10–15 years, but sometimes longer (WHO, 2016). Early detection and treatment of HIV can reduce progression of the infection into worsening state, within 5-10 years of being infected with HIV, the majority of people develop signs of HIV-related illness (WHO, 2016). The World Health Organization reported that about 54% of adults and 43% of children infected with HIV in the world are put on Antiretroviral treatment. Evidence indicates that Antiretroviral therapy (ART) has the potential to slow the disease progression of HIV into AIDS, however, majority of persons living with HIV do not adhere to treatment or most people infected with HIV are unaware of

their HIV status which consequently result in increase in viral load (WHO, 2017, 2015; Kalichman et al., 2010).

In 2017, the World Health Organization stated that about 36.7 million people in the world are living with HIV with about 2.1 million new cases recorded as at the end of the year 2015; so far in the world, an estimated 35 million people have died from HIV, about 70% of people with HIV in the world know their status (WHO, 2017). According to the World Health Organization, approximately 70% of HIV infected individual in the world reside in Sub-Sahara Africa (WHO, 2017). Though HIV morbidity and mortality have declined in the world by 35% and 28% respectively, sub-Saharan Africa continues to be the most affected region in the world (WHO, 2017).

The median HIV prevalence for 2016 in Ghana is 2.4%, an increase from the 2015 prevalence of 1.8% and 2014 prevalence of 1.6% (Ghana AIDS Commission, 2017). This indicates an increase in HIV prevalence in Ghana over the past two years. HIV prevalence at regional ranged from 0.7% in the Northern region of Ghana to 2.7% in the Volta region and Brong Ahafo region (Ghana AIDS Commission, 2017). Sunyani has a fluctuating HIV prevalence which almost stabilized at 2.0% in 2012 and 2013, however, HIV prevalence in Sunyani steadily increased to 5% in 2014 which is double the Brong Ahafo regional prevalence of 2.6% (Ghana AIDS Commission, 2017). Prior to 2016, there has been a steady decrease to 3.8% in 2015, however, the prevalence in Sunyani is double the Brong Ahafo Regional prevalence of 1.7% (Ghana AIDS Commission, 2017). According to the Ghana National HIV Sentinel Site Survey report, 2016, Sunyani was one of the thirteen (13) sites that did not change in prevalence over the previous year (Ghana AIDS Commission, 2017)

1.2 Problem Statement

Despite all the interventions put in place by the Ghana National AIDS/STI Control Program to reduce the prevalence of HIV in Ghana, HIV continues to be a Public Health threat affecting many Ghanaian adults aged between 15-49 years old with females mostly infected (Ghana Statistical Service, 2015). In 2016, the national HIV prevalence of 2.4% was recorded in Ghana with a higher prevalence among urban site (Ghana AIDS Commission, 2017). Large proportions of new HIV cases are recorded every year and these are not evenly distributed per geographic locations. Sunyani tends to record HIV prevalence (4.2%) far above Brong Ahafo Regional prevalence of 2.7% and the national average of 2.4% (Ghana AIDS Commission, 2017).

Several studies have revealed that unprotected sex; contracting another STI, sharing contaminated needles, syringes, accidental needle stick injuries, breast milk, unfavorable economic position of women, rate of rape, inconsistent condom, alcohol consumption are known factors associated with HIV transmission (Delva & Abdool Karim, 2014; Ncube et al., 2012; Chimoyi et al., 2015; WHO, 2016). The National AIDS/STI Control Program has an overall goal of reducing the impact and effect of HIV with intervention such as "know your HIV status", free "Prevention of Mother-to-Child Transmission", "condom promotion and distribution", "blood safety", "HIV Exposure Prevention in the Health care and other settings". In the face of all these interventions by the National AIDS/STI Control Program, the prevalence of HIV in the Sunyani Municipality over the past three years is consistently above the Brong Ahafo Regional Prevalence. In 2014, HIV prevalence of 5.2% was recorded in Sunyani which is a double of the Brong Ahafo Regional prevalence of 2.6%, whiles 2015 recorded a prevalence of 3.8% which is almost a double of the Brong Ahafo Regional prevalence of 1.7%, besides, a prevalence of 4.2% was recorded in 2016 as compared to 2.6% in the Brong Ahafo Region. Barring any move by the regional and district Health Directorate to identify and

determine the underlying cause of the increase in 2017 could lead to a further increase in HIV prevalence in the Sunyani municipality. Identifying the factors that drive this unusual high prevalence of HIV will help in targeted intervention in the Sunyani municipality. This study seeks to identify factors contributing to the fluctuating trend in HIV prevalence over the past three years in the Sunyani Municipality.

1.3 Conceptual Framework

Figure 1.1 shows the relationship between the dependent variable (HIV infection) and independent variables. Several factors can interplay to increase or decrease the prevalence of HIV. Numerous studies have identified some demographic factors to be significantly contributing to the prevalence of HIV. They include age (Beauclair, Helleringer, Hens, & Delva, 2016; Blanco et al., 2012), sex (Cederfjäll, Langius-Eklöf, Lidman, & Wredling, 2001; Landman et al., 2008; Menzaghi et al., 2014), marital status (Fagbamigbe, Adebayo, & Idemudia, 2016; Kposowa, 2013), education (Harling & Bärnighausen, 2016; Lakew, Benedict, & Haile, 2015),occupation (Wyżgowski, Rosiek, Grzela, & Leksowski, 2016), place of residence (Madise et al., 2012), and religion (Genrich & Brathwaite, 2005).

Many factors may interplay to increase or increase the prevalence of HIV. Some studies have attributed HIV prevalence to alcohol use, smoking, late testing for HIV, herbal treatment and infrequent condom use (Achappa et al., 2013; Jiraphongsa & Ph, 2011; Peltzer, Friend-du Preez, Ramlagan, Fomundam, & Anderson, 2010; Wasti, Simkhada, Randall, Freeman, & van Teijlingen, 2012).

Late testing for HIV results in HIV infection progressing to AIDS as well as increase the spread of the infection due to increased viral load (Attonito, Dévieux, Lerner, Hospital, & Rosenberg, 2015). Majority of HIV infected individuals do not know their HIV status earlier in the initial phase of the HIV infection which increases HIV mortalities and progression of the HIV

infection into severe stages (AIDS) (Nachega et al., 2011). When HIV infected individuals are diagnosed earlier in the initial phase of the HIV infection and antiretroviral treatment are started earlier enough, HIV infection is reduced and the progression of HIV into AIDS is decreased with increased immunity of the body to fight the HIV infection. (Davis et al., 2013).

Condom use among sexually active HIV patients can results in the reduction of HIV infection however, HIV positive patients do not use condoms every time (Schackman et al., 2008). Sexually transmitted infections have been related to the increased risk of contracting or transmitting HIV infection (WHO, 2012). Sticking to one sexual partner reduce the transmission rate of HIV infection. (Peltzer et al., 2010) (Alemayehu, Aregay, Kalayu, & Yebyo, 2014).

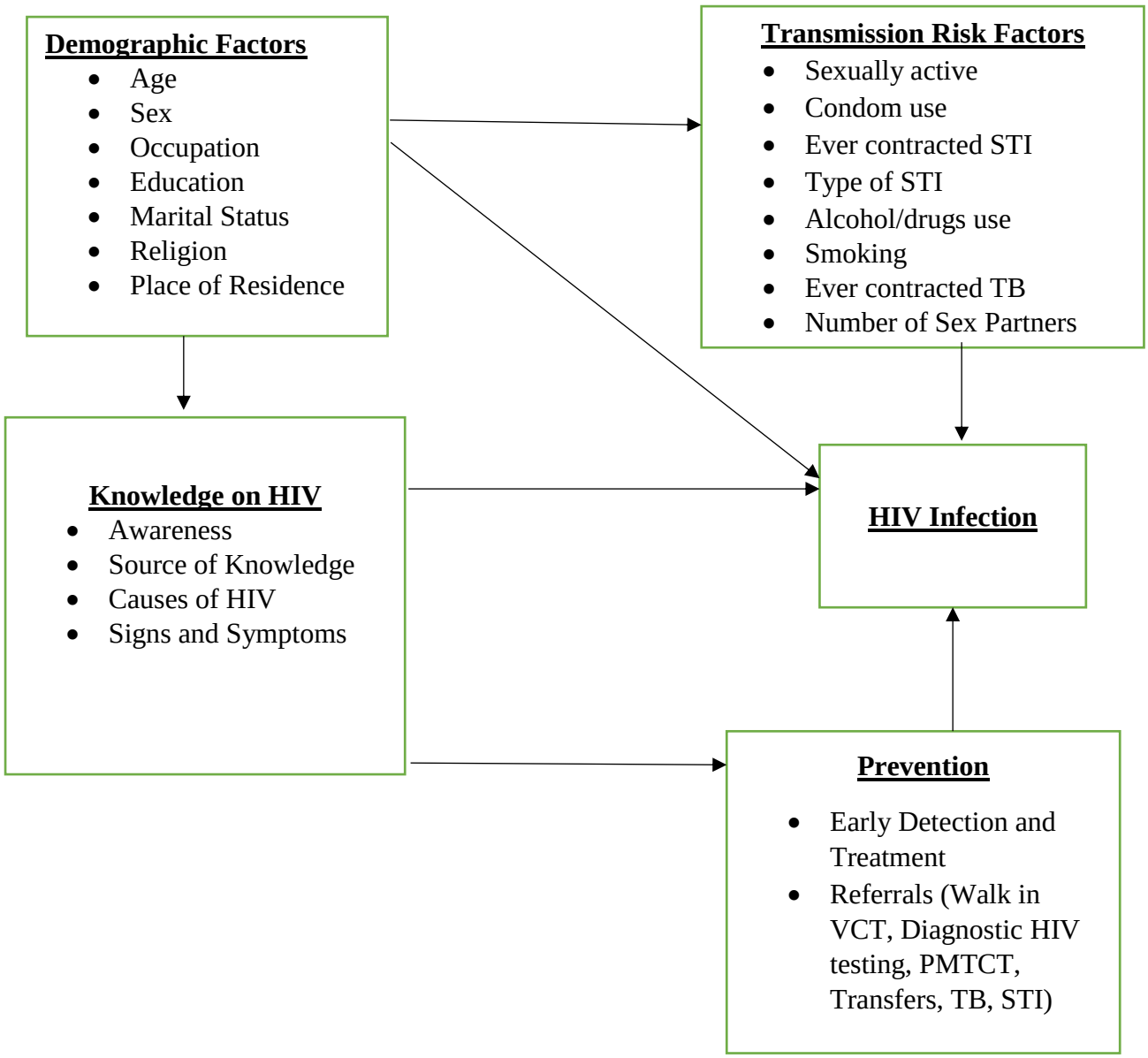

Figure 1.1: Conceptual Framework

1.4 Justification

Information on the hot spot of HIV and factors related to high HIV incidence will be used to address the burden of HIV and reduce the risk of HIV transmission in local communities. The information this study will generate will help the National AIDS/STI Control Program in guiding the ten regions of Ghana and all the districts working to achieve the overall goal of reducing the impact and effect of HIV in Ghana. Furthermore, policy-making and health intervention planning are mostly dependent on knowledge. Also, information generated from the study will be beneficial to the Regional/District Health Management teams in controlling transmission of HIV in the region and the municipality.

1.5 Research Question

1. What proportion of HIV patients live in the 6 sub-districts in Sunyani Municipality?
2. What are the factors associated with HIV prevalence in Sunyani Municipality?

1.6 Main Objectives

To assess factors associated with the fluctuating trend in HIV prevalence in Sunyani

1.6.1 Specific Research Objectives

1. To determine the proportion of HIV patients living in each of the 6 sub-districts in the Sunyani Municipality
2. To determine the knowledge of clients on HIV in the Sunyani Municipality
3. To assess factors associated with the prevalence of HIV in the Sunyani Municipality

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of HIV

HIV/AIDS remains a global burden in the world with 30 years long-standing history of infecting over 70 million people with 35 million deaths recorded due to HIV/AIDS (WHO, 2017a). It is an established fact that the majority of factors such as demographic factors, alcohol use, smoking, late testing for HIV, previous history STI, multiple sexual partners, of and infrequent condom use and knowledge on HIV interplay to contribute to the prevalence of HIV in the world. These have serious consequences on the individuals who are at higher risk of deaths and to the community in which these individuals reside probably giving rise to many of new infections being reported. The Joint United Nations Programme on HIV/AIDS estimated that 2.1 million individuals worldwide were newly infected with HIV in 2015, but only 70% of the people infected with HIV know their HIV status with over 40% untested and not on Antiretroviral Therapy (UNAIDS, 2016; WHO, 2017b). The World Health Organization, (2016) estimates that about 36.7 million people in the world were infected with HIV at the end of 2016 but a significant proportion of adults aged 15–49 years are living with HIV. According to the global HIV and AIDS statistics, out of the 36.7 million HIV infected people in the world, 1.8 million were children aged less than 15 years old with a majority of these children living in sub-Sahara Africa (UNAIDS, 2016). In 2015, an estimated 1.9 million adults aged 15 years and older became newly infected with HIV and 47% of them were women. Among the new cases that occurred in 2015, 58% occurred among adolescent girls and young women. Majority of HIV/AIDS cases in the world is 60% more likely to be among adolescent girls and young women aged 15-24years (UNAIDS, 2014).

The prevalence of HIV varies from country to country, however, the majority of the cases come from low and middle-income countries including Africa (WHO, 2016). The number of HIV infected people during 2016 in sub-Sahara Africa was 25.5 million as compared to 6.7 million in Asia and 4.2 million in Europe and America (WHO, 2016). HIV/AIDS affects people of all ages and sex. Compared to the percentage of adults living with HIV/AIDS in ten countries with the highest prevalence of HIV/AIDS in the world, Swaziland had the highest prevalence of 27.2%, followed by Lesotho with 25%, Botswana with 21.9%, South Africa 18.9%, Namibia 13.8%, Zimbabwe 13.5%, Zambia 12.4%, Mozambique 12.3%, Malawi 9.2% and Uganda, 6.5% (World Bank, 2017). Figure 2.1 shows the global share of the population infected with HIV.

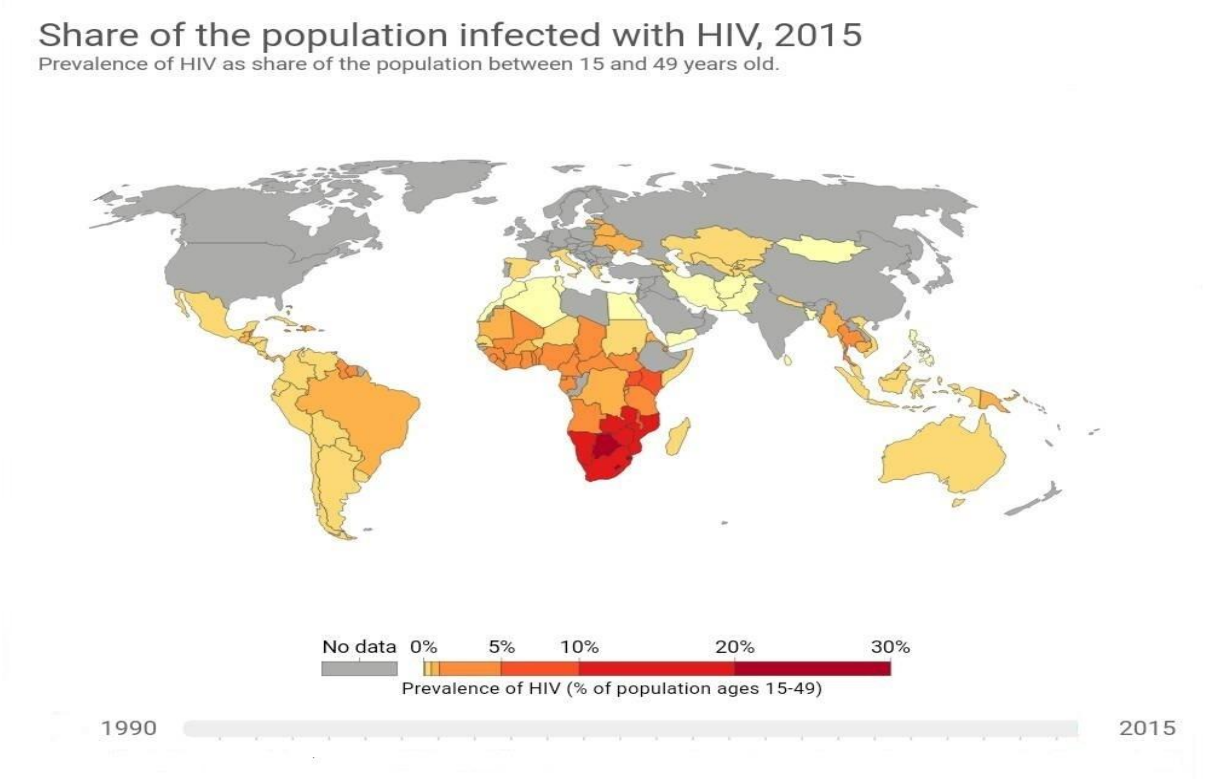

Figure 2.1: Global share of Population infected with HIV from 1990 to 2015

Adapted from the World Bank-World Development Indicator, 2017.

2.2 Transmission and Presentation of HIV

HIV is the virus that causes HIV infection which advances into AIDS. Mainly, HIV spread from an HIV infected person to uninfected persons. The most common fluids capable of transmitting HIV are blood, rectal fluids, semen, vaginal fluids, pre-seminal fluids and breast milk. For HIV to be transmitted, these fluids of an infected person come in contact with a mucous membrane or damaged tissue or are directly injected into the bloodstream (from a needle or syringe) of an uninfected person WHO, 2017). Mucous membranes are found inside the rectum, vagina, penis, and mouth. HIV is mainly spread through sexual intercourse and sharing injection drug equipment, with HIV infected persons (WHO, 2017). The infection-fighting CD4 of the immune systems are attacked by the HIV infection which results in loss of CD4 count thereby making it difficult for the body to fight infections. Gradually, HIV can destroy the immune systems and advance to AIDS without treatment (Sahoo, Ram, Rao, & Sudhakar, 2015). Without medication, HIV infection gets worse over time. The advancement of HIV infection in three stages namely (1) acute HIV infection, (2) chronic HIV infection, and (3) acquired immunodeficiency syndrome (AIDS). Antiretroviral treatment (ARV) have proved to prevent HIV infection from advancing to AIDS, however, there is no cure for HIV. HIV medicines contribute to the reduction of viral load thereby reducing the risk of HIV transmission, also, adherence to HIV medicines help people infected individuals live longer, healthier lives (Centers for Disease Control and Prevention, 2017).

HIV diagnosis depends on the clinical presentation of symptoms and physical signs. HIV infected individuals may present with physical signs and symptoms of any of the stages of HIV infection. Acute seroconversion presents as a flulike illness which consists of malaise, of fever and a generalized body rash (WHO, 2017). The signs and symptoms are those of the presenting illness, meaning that HIV infection should be suspected as an underlying illness when unusual

infections present in apparently healthy individuals (Ref). Weight loss may be apparent in an HIV infected person. Evidence for HIV risk factors or the presence of opportunistic infections may be clues to suspecting HIV infection.

2.3 Factors Contributing to HIV transmission

Transmission of HIV is affected by many factors. For instance, some HIV infected persons who are not aware that they are infected with HIV may not understand the disease could be very severe even though HIV diagnosis and treatment services are free in most countries of the world. Also, many HIV infected people may delay going to a health care facility because they cannot pay the transportation costs to the facility, which are usually far away from their home, or take time out of their day to visit a health care provider due to distance from Anti-retroviral Therapy Centers (Ankomah et al., 2016; Chimoyi et al., 2015).

There is a statistically significant association between having more than one sexual partner, having sex for money, medical history of injections and HIV infection (Choudhry, Ambresin, Nyakato, & Agardh, 2015; Ghanem, Little, & Diego, 2015; Wilson Chialepeh & Sathiyasusuman, 2015). Omori and Abu-Raddad indicated that several factors contribute to HIV infection including older age, separated (marriage), women of lower class, HSV-2 and HIV infection, widow, divorced and lower education levels (Omori & Abu-Raddad, 2017). This finding is supported by Pettifor and colleagues in 2005 where they found out that HIV infection is significantly associated with men with past 12 months history of genital ulcers [(AOR), 1.91; 95% confidence interval (CI), 1.04–3.49)], In women, 12 months previous history of unusual vaginal discharge was associated with HIV infection (Pettifor et al., 2005). The World Health organization stated indicated previous history of tuberculosis to be a major risk factor among People Living with HIV (PLWHAs) (WHO, 2016). In addition, the previous history of sexually transmitted infection is the transmission risk factor of HIV (Méda et al.,

2013). People Living with HIV AIDs (PLWHAs) had survival free tuberculosis (TB) rate of 91% with a TB incidence rate of 2.8 per 100 people/years. Among HIV clients with CD count <200, the incidence of tuberculosis was higher (Batista et al., 2013). Previous STD was documented for 364 (60.9%; 95% CI: 56.9%-64.8%) women. HIV prevalence of HIV is higher among people with previous STDs, people who had sex before the age of 15 years, people with more than one sexual partner and sex workers (Clínicas, Medicina, & Paulo, 2012). Ruan et al., (2007) stated that having more than a sexual partner and having sex with no protection as well as a history of sexually transmitted infection suggest a potential rapid spread of HIV. Similarly, Manyahi et al., (2015) stated that having multiple sex partners and drug use was associated with HIV risk predictors. Rahmanian et al., (2011) suggests related illnesses as a major contributor to HIV morbidities and mortalities among PLWHA.

Globally, many interventions have been instituted to reduce the burden of HIV, however, one thing is certain, that HIV treatment should be given to all HIV infected living with HIV who need treatment (UNAIDS, 2014). Globally, lower HIV morbidity and mortality rates have been achieved through access to ART; meanwhile, a lot of people with HIV are undiagnosed so therefore do not know their HIV status (Kharsany & Karim, 2016). For effective antiretroviral therapy for all PLWHA, as high as 95% and more level of adherence is required however there are many barriers to adherence. In southern India, a study by Achappa et al., (2013) revealed that barriers to ART service include lack of financial resources, non-adherence, lack of HIV treatment supporter, depression, use of alcohol, social stigma and side effects to antiretroviral therapy were barriers to adherence. Furthermore, a study in Thailand which revealed that HIV treatment adherence is associated with shame and stigma from community members and family as well as access to HIV treatment service (Jiraphongsa & Ph, 2011).

In an Ethiopian study, Soboka, Tesfaye, Feyissa, & Hanlon, (2014) found that being a male, cigarette smokers and alcohol use are associated with HIV infection.

Hajizadeh, Sia, Heymann, & Nandi (2014) revealed that sub-Saharan Africa has HIV/AIDS concentrated among individuals with higher socioeconomic status, however, there is a concentration of HIV/AIDS in Swaziland and Senegal among HIV infected people residing in poorer households.

Fagbamigbe, Adebayo, & Idemudia, (2016) stated that women who are formerly married have higher odds of being infected with HIV infection as compared to women currently married and never married women. In addition, women who first had sex before attaining their 15th birthday have a higher chance of getting HIV infection as compared with women who delayed sex to later years. Majority of sexually active young women who did not use a condom during their first sexual intercourse have a higher risk of being infected with HIV (Obidoa, M'Lan, & Schensul, 2012). Another study in the United States revealed that divorced and separated individuals who divorced are more likely to die of HIV/AIDS than individuals who are married (Kposowa, 2013). There is 13 times the likelihood of dying of HIV/AIDS among persons who are single or never married as compared to their married counterparts. Educational attainment is significantly associated with HIV prevalence among women, besides, people who have had secondary education or higher and aged between 25-34 years have lower HIV prevalence (Harling & Bärnighausen, 2016).

Early case detection and early initiation of antiretroviral therapy are very essential in reducing the prevalence and mortalities of HIV (Cohen et al., 2011; Cohen & Corbett, 2011; De Cock & El-Sadr, 2013; Kitahata et al., 2009; Mbitila & Tchuenche, 2012; Severe et al., 2010). Elsasser and the World Health Organization have revealed that effective antiretroviral (ARV) treatment can control HIV and help prevent its transmission (WHO, 2016; Elsasser, 2012). This

suggests that adhering to antiretroviral therapy will reduce the loss of productivity due to illness, disability, and deaths in addition to reducing the chances of pregnant women transmitting the infection to their newborn. Though people living with HIV tend to be the most infectious in the first few months, about 40% of the world's population are unaware of their status until later. Most late testers of AIDS are more likely to die shortly after diagnosis due to immunosuppression (Castilla et al., 2002; Oppong Asante, 2013; UNAIDS, 2016; WHO, 2016).

A community-based study in Hawasa in Ethiopia revealed that majority of the people in Hawassa are knowledgeable about HIV/AIDS (Mekonnen, Behailu, & Wakgari, 2018). Tertiary student has higher knowledge of HIV/AIDS among Nigerian students in Lagos, Nigeria (Akodu, 2014). However, risk perception is low with high-risk sexual behaviors. Mekonnen et al., (2018) revealed that the majority of people stated that HIV is transmitted through having unprotected sex, from mother to their infants and through the sharing needles or syringes. The sources of information were mass media (32 (12.8%)) and healthcare facility (26 (10.4%)); and in 181 (72.4%) of the respondents, the sources of the information were more than one. In Ghana, most people are knowledgeable about HIV Voluntary Counselling Testing and majority of them indicated that school and peers were the major sources of information (Thanavanh, Harun-Or-Rashid, Kasuya, & Sakamoto, 2013).

2.4 Hot Spot of HIV

In recent times, geospatial techniques are commonly used for combining, examining and mapping various type of geographically referenced data (demographic, statistical, topographic, epidemiologic and other data) to turn geographic data into information that can be used for health research, program planning, health education, monitoring and evaluation and decision-making (Kandwa, Garg, & Garg, 2009; Moise et al., 2013). Spatial analyses are today growing popularity as an effective tool used in many fields especially in epidemiology to understand

geographic changes in areas such as HIV/AIDS to underpin the geographic changes in the HIV/AIDS prevalence. (Martinez et al., 2014).

To determine where clusters in data exist, density can be used, however, density is not sufficient to determine if cluster existing in data is statistically significant. Spatial interpolation is a geospatial analysis method used to identify the locations of statistically significant hot spots and cold spots in geodata (Moise et al., 2013). HIV prevalence in Ethiopia ranged from 10% to 21% in the central, eastern and western regions of the country which revealed areas of HIV density, however, statistical significance is needed to determine hot or cold spot of HIV by clustering (Lakew et al., 2015).

Coburn et al. used spatial techniques to construct a map that revealed the countrywide geographic dispersion pattern of HIV infected individuals. Their analyses showed that the spatial variation helps in determining areas of the country where HIV infection is concentrated for effective control and preventive measures (Coburn, Okano, & Blower, 2017). HIV/AIDS has been associated with place of residence, in support of that Lakew et al., (2015) stated that HIV prevalence is higher among urban residents and females than among rural residents and males.

CHAPTER THREE

METHODS

3.1 Study design

A facility based cross-sectional study was conducted among clients accessing HIV testing and counseling services in the Sunyani Municipality of Ghana from March 2018 to August 2018. The study was conducted in three health facilities identified as having recorded the highest number of HIV positive cases in the Sunyani Municipality. Data on patient demographics, knowledge on HIV, transmission risk factors and HIV prevention were collected and analyzed to determine factors associated with HIV prevalence in the Sunyani Municipality.

3.2 Study Location/Area

Sunyani is the capital of the Brong Ahafo Region of Ghana. The district lies between Latitudes 7^0 20'N and 7^0 05'N and Longitudes 2^0 30'W and $2^0$10'W and shares boundaries with Sunyani West District to the North, Dormaa District to the West, Asutifi District to the South and Tano North District to the East. There are six sub-districts in Sunyani with 31 health facilities and 34 CHPS Zones. There are 18 PMTCT sites with all ART services, four out of 31 health facilities in the municipality provide voluntary HIV testing and counseling services, including regional and municipal hospitals. The population of Sunyani is 141, 251 representing 5.3% of the Brong Ahafo Region's total population. Males constitute 49.9% and females, 50.1% of the total population. More than 83.1% of the population is urban. About 3 in 10 (35.7%) of the population aged 12 years and older are married, 53% have never married, 10% are in consensual unions, 3.1% are widowed, 1% are divorced and another 1% separated (Ghana Statistical Service, 2014). A greater proportion of those who have never married (66.7%) is economically not active with 4.1% unemployed. Out of the population 85.9% aged 11years and older are literate and 14.1% non-literate. About 62% of the population aged 15 years and

older is economically active while 38.1% are economically not active. Of the economically active people, 93.2% are employed while 6.8% are unemployed. Among the economically inactive people, the majority (75.4%) are students. Of the population 15 years and older, 48.4 % are self-employed without employees, 7.8% are contributing family workers, 1.7% are casual workers and 0.4 % are domestic employees (house helps). Figure 3.1 shows a map of Sunyani

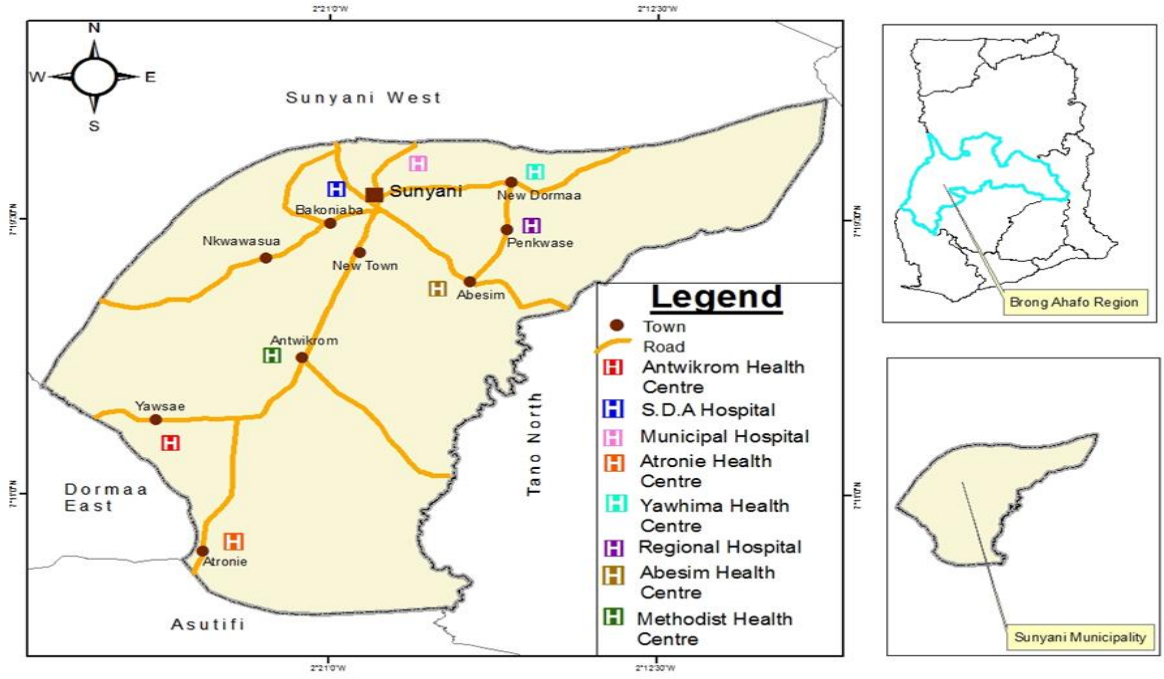

Figure 3.1 Map of Sunyani

3.3 Study Population

The study population consisted of all adults aged 15 years and older who had access to HIV testing and counseling services in the three hospitals selected and were advised and tested for HIV between March 2018 and August 2018.

3.4 Inclusion Criteria

All clients including pregnant women accessing HIV testing and counseling services in any of the three selected hospitals in the Sunyani municipality and have never tested positive for HIV in the past.

3.5 Exclusion Criteria

Any client accessing HIV services in the three selected hospitals who have previously tested positive for HIV and on antiretroviral treatments were excluded from the study.

3.6 Study Variables

Dependent	Independent
The main outcome variable is HIV infection	• **Demographic variables** Age, sex, religion, occupation, marital status, education, employment, geographic location, place of residence • **Knowledge of HIV** Awareness on HIV, the source of Information, causes of HIV, signs, and symptoms of HIV • **Transmission risk factors** Alcohol and or drug use, smoking, condom use, ever contracted STI, sexually active, past history of TB infection, the frequency of smoking, number of sexual partners. • **Prevention of HIV** Referral for HIV testing, early detection, and treatment

3.7 Sampling Method

3.7.1 Sample Size Determination

The minimum sample size was determined using an estimated HIV prevalence of 4.2% (HIV Sentinel Survey Report, 2017), at an alpha of 0.05 and the desired confidence interval of 95%.

The sample size was calculated using the Cochrane formula $n = \frac{Z^2 pq}{d^2}$

Where n=sample size, Z=z value for the 95% confidence interval, p=prevalence of HIV in the Sunyani Municipality reported by 2016 HIV Sentinel Survey Report, q =estimated proportion of the population in Sunyani who are not living with HIV.

d= margin error set at 5%. Literature has indicated that if the prevalence is below 10%, it is recommended that d is half of the prevalence (Naing, Winn, & Rusli, 2006). Therefore, d for this study will be

$$d = \frac{0.042}{2}$$, Therefore $d = 0.021$

Hence $n = \frac{1.96^2 * 0.042 * 0.958}{0.021^2}$

$n = 350.1 \approx 351$

An attrition rate was computed as $n = \frac{ESS}{1 - NR}$

Where ESS=Effective sample size, NR=Proportion of the non-response

$$n = \frac{351}{1 - 0.2}$$

n = which rounded off to give 445. Therefore, the final Sample size of 445 was considered for this study.

This sample was allocated in proportion to the total number of hospitals tested for HIV in 2017.

Specific numbers to each district was given using the formula $nk = \frac{Nk}{N} * n$, where nk is the number of subjects that were required for interview in hospital k, Nk number of clients tested for HIV in hospital k, N the total number of clients tested for HIV in all the three hospitals in 2017 and n is the required sample size for the study. Table 3.1 presents study proportional sample used for each study site

Table 3.1: Study Site and Sample Population

Hospital	Number tested for HIV	Proportional sample
Regional Hospital	3428	187
Municipal Hospital	2538	139
SDA Hospital	2178	119
Total	**8144**	**445**

3.7.2 Sampling Method

Three hospitals in the municipality were selected for the study. The hospitals with the highest number of HIV test for 2017 were selected. The three health facilities offering HIV counseling and testing services in the municipality were included to determine the proportion of HIV test done in 2017. Samples were then proportionately allocated to the hospitals based on their estimated annual data on a number of HIV tests conducted. All clients accessing HIV testing and counseling services in the three hospitals were selected and consented to the study until the required sample size was met.

3.7.3 Selection of Participants

Clients accessing HIV testing and counseling services at the three facilities were included in the study. The data collection took place for 20 working days. The required sample for each facility was divided by the number of working days to obtain the number of participants to be interviewed for each day. For each facility, a paper with yes and no were folded and mixed in a box. Participants were asked to select one paper when they visited the HIV counseling and testing centers. Participants who selected yes were included in the study while those who selected no were included in the study. Regional Hospital interviewed 9 clients a day, Municipal hospital interviewed 7 clients a day and SDA hospital interviewed 6 clients a day. Consenting clients accessing HIV counseling and testing services were asked some few questions to obtain information concerning their demographic and socio-economic characteristics, knowledge of HIV, transmission factors of HIV and measures for early detection and prevention of HIV. During counseling, clients were interviewed and HIV testing was done afterward.

3.8 Data Collection Method and Instrument

An interviewer assisted structured questionnaire was used to collect the data. Participants were selected from all HIV counseling and testing services centers at the three selected hospitals between March 2018 and November 2018. The research assistants conducted face to face interviews with clients accessing HIV counseling and testing services in the three selected hospitals. The data collection tool captured the client's socio-demographics including age, sex, educational level, occupational status, marital status, and religion. Also, data on HIV transmission risk factors were captured to include the previous history of STI, type of STI previously contracted, the previous history of TB, a number of sexual partners, alcohol use, smoking status, and condoms use.

3.9 Data Quality Control

Research assistants were trained prior to the start of the study. Training entailed an explanation of the questionnaire, ethics and seeking of informed consent from study participants. Questions in the questionnaire were explained to research assistants to prevent interviewer bias. They were trained to conform to the ethical guidelines of the study. Again, the research assistants had a day – training programme on how to use the spirometer. During data collection in the field, forty-four (10%) of the completed questionnaires containing raw data were selected by the supervisors at random and checked to identify errors and/or omissions and corrective actions made. The checks were repeated during data entry. Data were double entered into excel and merged in order to detect errors. All the data were backed up with an external storage device. The questionnaire was pretested to assess the clarity of the questionnaire, the needed time to complete a questionnaire and suitability of the questionnaire to the participants. The questionnaire was pre-tested in Owusu Memorial and Green Hill Hospitals which were not part of the study. Pretesting was done

3.10 Data Analysis

Entered data in Microsoft excel were imported into Stata version 15 for cleaning and analysis. Descriptive statistics were first done by running frequencies and proportions. Continuous variables such as age were summarized into mean. Age was then categorized into 4 years interval according to the Ghana HIV Sentinel Site Report. Pearson chi-square test was done to determine the significant difference between HIV prevalence and the categorical variable and was presented as a contingency table with p values and Fisher's exact test was done for variables with frequencies less than 5. At the bivariate analysis, variables with p-value <0.05 were considered to be statistically significant. Binary logistic regression was done to determine factors associated with HIV prevalence. Significant variables and variables which literature

have revealed are associated with HIV infection were modeled in a multiple logistics regression to determine factors that are statistically significantly associated with HIV infection. The results were presented in a two by two table to display frequencies, percentages, crude and adjusted odds ratios, 95% confidence interval and p values.

3.11 Ethical Clearance

Ethical clearance was sought from the Ghana Health Service Ethics Review Committee and approval was given for the implementation of the study protocol (GHS-ERC: 082/12/18). Permission was sought from The Brong Ahafo Regional Health Directorate, The Municipal Health Directorate and Sunyani Municipal Hospital, Brong Ahafo Regional Hospital and Seventh Day Adventist Hospital. Study objectives, the benefit of the study and assurance of confidentiality were explained to the Regional/Municipal Health Directorate, SDA Hospital, BrongAhafo Regional Hospital and the Sunyani Municipal Hospital.

Participants' confidentiality and privacy were respected during questionnaire administration and interactions by assigning each respondent a code that could be traced to the registration number in the HIV counseling and testing register. To ensure confidentiality and privacy, the names of participants were not used in the write- up since the questionnaire was coded.

Findings of the study were reported such that it was non-person identifiable. All data collected was stored in a locked folder on the computer as well as stored under lock and key and would be destroyed after ten years. Access to the data was restricted to only those involved in the research such as principal investigator and supervisor.

CHAPTER FOUR

RESULTS

4.1 Characteristics of Study Participants

A total of 445 respondents were interviewed and tested for HIV during the period of the study. Table 4.1 shows the background characteristics of the respondents interviewed during the period of the study. Ages of participants ranged from 19-66 years with a mean age of 30.8 years (SD ±8.5years). The mean age for males were 30.3years (SD ±7.9years) while that of females was 34.2 (SD ±10.8years). Out of the 445 respondents, 143 representing 32.1% were within the age group 25-29, also, 117/445 representing 26.3% were within the age group 30-34 and 65/445 representing 14.6% were within the age group 20-24. There were more females than males with 382 females out of 445 respondents constituting 85.8% of the respondents. Respondents with tertiary education were the majority 180/445 representing 40.5%. Majority of the respondents were self-employed with 230/445 depicting 51.7%. Most (305/445, 68.5%) of the respondents were married. A majority (381/445, 89.7%) of Christians participated in the study as compared to Muslims (64/445, 10.3%). Out of the 445 clients interviewed and tested for HIV, 46 (10.3%) were reactive (positive).

Table 4.1: Background Characteristics of Study Participants

Variable	Number (N)	Frequency (%)
Age in years (M±SD)	30.8 (±8.5)	
Age group (years)		
<=19	15	3.4
20-24	65	14.6
25-29	143	32.1
30-34	117	26.3
35-39	56	12.6
40-44	17	3.8
45+	32	7.2
Age for Female (M±SD)	34.2 (SD ±10.8)	
Age for male (M±SD)	30.3 (SD ±7.9)	
Sex		
Female	382	85.8
Male	63	14.2
Education		
No Education	30	6.7
Primary	24	5.4
JSS	112	25.2
MSLC	15	3.4
SEC/TEC	84	18.9
Tertiary	180	40.5
Status of Occupation		
Unemployed	17	3.8
Employed	156	35.1
Self Employed	230	51.7
Student	42	9.4
Marital Status		
Married	305	68.5
Single	100	22.5
Separated	16	3.6
Cohabiting	24	5.4
Religion		
Muslim	64	14.4
Christian	381	85.6
HIV Test Results		
Reactive	46	10.3
Non-Reactive	399	89.7

4.2 Background Characteristics of Respondents by their HIV Status in Sunyani Municipal

Table 4.2 shows the background characteristics of respondents by their HIV status. Most of the clients (117/445) who tested for HIV were in the age group 30-34 years. The difference between the age groups among HIV reactive clients and non-reactive clients were statistically significant (p=0.003). Majority (38/46, 82.6%) of the HIV reactive clients were females. Clients who have attained Junior High School education were the majority (14/46) who tested positive for HIV followed by those who have attained senior high school education (12/46). There was an evidence of statistically significant difference between educational levels (p<0.001) among HIV reactive clients and non-reactive clients. Most of the self-employed clients tested positive for HIV. The difference between occupational status among HIV reactive and non-reactive was statistically significant (p=0.002). Most (28/305, 9.2%) of the married respondents tested positive for HIV. There was a statistically significant association for marital status and HIV status (p=0.013). Majority of the respondents (37/46) who tested positive for HIV were Christians.

Table 4.2: Background Characteristics of Participants according to their HIV Status

Variable	Total N	Reactive N (%)	Non-Reactive N (%)	$\chi 2$	P value
Age group					**0.003***
15-19	15	1 (6.7)	14 (93.3)		
20-24	65	3 (4.6)	62 (95.4)		
25-29	143	10 (6.9)	133 (93.1)		
30-34	117	13 (11.1)	104 (88.9)		
35-39	56	5 (8.9)	51 (91.1)		
40-44	17	4 (23.5)	13 (76.5)		
45+	32	10 (31.3)	22 (68.8)		
Sex				0.4415	0.506
Female	382	38 (9.9)	344 (90.1)		
Male	63	8 (12.7)	55 (87.3)		
Education					**<0.001***
No Education	30	7 (23.3)	23 (76.7)		
Primary	24	4 (16.7)	20 (83.3)		
JSS	112	14 (12.5)	98 (87.5)		
MSLC	15	4 (26.7)	11 (73.3)		
SEC/TEC	84	12 (14.3)	72 (85.7)		
Tertiary	180	5 (2.8)	175 (97.2)		
Status of Occupation					**0.002***
Unemployed	17	3 (17.7)	14 (82.3)		
Employed	156	8 (5.1)	148 (94.9)		
Self Employed	230	34 (14.8)	196 (85.2)		
Student	42	1 (2.4)	41 (97.6)		
Marital Status					**0.013***
Married	305	28 (9.2)	277 (90.8)		
Single	100	9 (9.0)	91 (91.0)		
Separated	16	6 (37.5)	10 (62.5)		
Cohabiting	24	3 (12.5)	21 (87.5)		
Religion				1.119	0.29
Muslim	64	9 (14.1)	55 (85.9)		
Christian	381	37 (9.71)	344 (90.3)		

p* Fishers exact, Bolded means statistically significant difference

4.3 Proportion of Clients Tested Positive per Sub Municipal

Table 4.3 shows the proportion of HIV reactive respondents per their sub-districts of residents.

Out of the 46 HIV positive clients, the majority of them (13) live outside Sunyani Municipal

and 8 out of the 46 live in Sunyani West District. Among those living outside Sunyani, the HIV prevalence recorded was 23.2% (95% CI: 13.9-36.2). The proportion living in Sunyani West district that tested positive for HIV during the period of the study was 5% (95% CI: 2.3-12.9). New Dormaa sub-district recorded the highest proportion of HIV reactive cases during the period of the study. Among residents of New Dormaa sub-district, HIV prevalence recorded was 11.9% (95% CI: 5.7-23.1). Abesim sub-district recorded the second highest with HIV prevalence of 11.5% (95%: 5.2-23.6) followed by Sunyani Central with a prevalence of 9.7% (95%: 4.9-18.4). The HIV prevalence for the other sub-districts is shown in table 4.3.

Table 4.3: Proportion of HIV Reactive Clients per Sub Districts in Sunyani

Sub District	Total (N)	Reactive n (%)	95% CI
Sunyani Municipal	445	46 (10.3)	7.8-13.5
Abesim	52	6(11.5)	5.2 - 23.6
Antwikrom	1	0	0
New Dormaa	59	7 (11.9)	5.7 - 23.1
Newtown/Bakoniaba	67	5 (7.4)	3.1 - 16.8
Penkwase	39	2 (5.1)	1.3 - 18.7
Sunyani Central	82	8 (9.7)	4.9 - 18.4
Sunyani West	84	5 (5.6)	2.3 - 12.9
Outside Sunyani	56	13(23.2)	13.9 - 36.2

CI - Confidence Interval

4.4 Knowledge of Respondents on HIV

Most of the participants knew about the symptoms of HIV. Among the participants, 82.9% indicated that weight loss is a symptom of HIV followed by skin rashes (40.9%), headache (38.4%), fever (35.1%) and diarrhea (28.3%).

Figure 4.1 shows participants knowledge of the cause of HIV. A majority (98.2%) of the participants indicated that they were aware of HIV. A majority (86.3%) were aware that HIV

is transmitted through sex, followed by infected sharps and needles (50.8%), blood transfusion (24.5%), mother to child transmission (17.5%) and blood spill (6.7%).

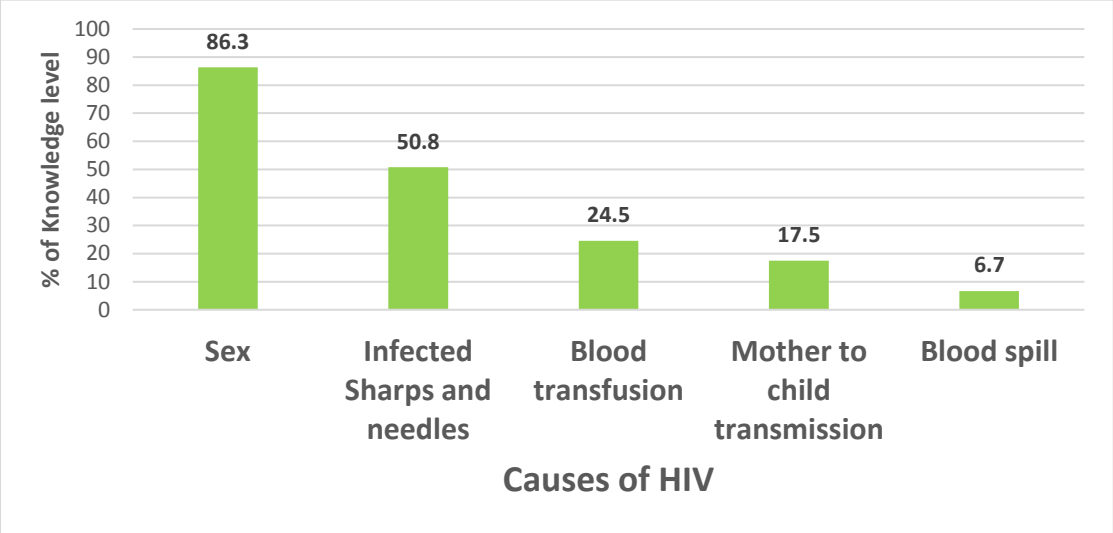

Figure 4.1: Participants knowledge on transmission of HIV

4.5 Transmission Risk Factors among clients testing for HIV in Sunyani, 2018

Table 4.4 shows the transmission risk factors among HIV reactive clients. Bivariate analysis showed significant differences between HIV status and previous history of STI ($p=0.003$), type of STI contracted ($p<0.001$), sexual activeness ($p<0.001$), number of sexual partners ($p<0.001$) and a history of tuberculosis ($p=0.04$). Among clients who had ever had sexually transmitted infection (STI), 25 out of 155 representing (16.1%) were HIV reactive however 21 out of 290 representing (7.2%) had no previous history of STI but were HIV reactive.

The proportion of HIV reactive clients who had ever contracted syphilis were 16/29 (55.2%), those who had a previous history of gonorrhea were 13/31 (41.9%) and 17/117 (14.5%) had a previous history of vaginal discharges. Also, among sexually active HIV reactive clients, 17 (25.8%) had not been active in the past 1month, 7 (21.2) never had sex and 22 (6.4) had been sexually active in the past one month.

The proportion of HIV reactive respondents who have two or more partners were 18/81 (22.2%), while 28/364 (7.7%) of HIV reactive clients have only one partner. Also, HIV reactive clients who have a past history of TB were 5/20 (25%) while 41/425 (9.7%) of HIV reactive respondents have no previous history of tuberculosis.

Table 4.4: Comparison of Transmission Risk according to HIV Status in Sunyani, 2018

	HIV Status				
	Total	**Reactive**	**Non-Reactive**	**χ2**	**p value**
	n (%)	**n (%)**	**n (%)**		
STI				8.609	**0.003**
Ever had STI	155	25 (16.1)	130 (83.9)		
Never had STI	290	21 (7.2)	269 (92.8)		
Type of STI				24.926	**<0.001**
Vaginal discharges	117	17 14.5)	100 (85.5)		
Syphilis	29	16 (55.2)	13 (44.8)		
Gonorhea	31	13 (41.9)	18 (58.1)		
Condom Use					0.570*
Never use	159	14 (8.8)	145 (91.2)		
Regular use	42	3 (7.1)	39 (92.9)		
Sometimes	244	29 (11.9)	215 (88.1)		
Sexually Active					**<0.001***
Never had sex	33	7 (21.2)	26 (78.8)		
Active past 1 month	346	22 (6.4)	324 (93.6)		
Not active past 1 month	66	17 (25.8)	49 (74.2)		
Number of sexual partners				15.092	**<0.001**
One	364	28 (7.7)	336 (92.3)		
Two or more	81	18 (22.2)	63 (77.8)		
Smoking status					0.236*
Ever Smoke	9	2 (22.2)	7 (77.8)		
Never smoke	436	44(10.1)	392 (89.9)		
Alcohol Use				0.936	0.333
Use alcohol	83	11 (13.3)	72 (86.8)		
Never use alcohol	362	35 (9.7)	327 (90.3)		
Frequency of alcohol use					0.497*
Regular	24	2 (8.3)	22 (91.7)		
Occasionally	59	9 (15.3)	50 (84.8)		
TB Status					**0.04***
Ever contracted TB	20	5 (25)	15 (75)		
Never Contracted TB	425	41 (9.7)	384 (90.4)		

p *: Fishers exact, Bolded means statistically significant difference

4.6 Measures for prevention of HIV Transmission

Table 4.5 shows the measures to prevent HIV transmission. There was evidence of statistical significance between those who have ever tested for HIV and those who have never tested for HIV. Among respondents who have ever tested for HIV, 31/377 (8.2 %) were HIV reactive while 15/68 (22.1%) of respondents who have never tested for HIV were HIV reactive during the period of the study. There was a statistically significant difference between HIV status and HIV counseling and testing (referrals and walk-in). Among clients linked to diagnostic HIV counseling testing, 12/71 (16.9%) were HIV reactive and 20/128 (15.6%) walk-in clients were also tested positive during the period of the study. Also, among pregnant mothers testing for HIV, 14/246 (5.7%) of them were HIV reactive.

Table 4.5: Comparison of HIV Preventive Measures according to HIV Status, 2018

		HIV Status			
	Total	Reactive	Non-Reactive	$\chi 2$	p value
	n (%)	n (%)	n (%)		
HIV Testing				11.898	**0.0001**
Ever tested	377	31 (8.2)	346 (91.7)		
Never Tested	68	15 (22.1)	53 (77.9)		
Referral for Testing				12.892	**0.002**
Diagnostic HIV	71	12 (16.9)	59 (83.1)		
Walk in VCT	128	20 (15.6)	103 (84.4)		
PMTCT	246	14 (5.7)	232 (94.3)		
Prevention of HIV					
Condom use				0.356	0.551
Yes	322	35 (10.9)	287 (89.1)		
No	123	11 (8.9)	112 (91.1)		
Abstinence				3.416	0.065
Yes	172	12 (6.9)	160 (93.1)		
No	273	34 (12.5)	239 (87.6)		
Faithfulness				0.504	0.478
Yes	254	24 (9.5)	230 (90.5)		
No	191	22 (11.5)	169 (88.5)		

Bolded means statistically significant difference

4.7 Factors Associated with HIV Prevalence

Table 4.6 is a univariate and multivariate logistic regression analysis testing the association between factors associated with HIV prevalence. In this table, clients age clients education level, clients history of sexually transmitted infection, type of STI previously contracted, clients history of tuberculosis, clients sexually activeness, number of sexual partners clients have, clients history of testing for HIV and clients referral for HIV testing were found to be associated with HIV prevalence at the univariate analysis with p values all < 0.05. In multivariate analysis, clients' age, clients' history of STI, number of sexual partners clients have, the client's history of testing for HIV remained statistically significantly associated with HIV prevalence. The odds of a client aged 40 years and above being HIV positive is 6 times the odds of a client aged 15-19 years but was not statistically significant (cOR:6.36, 95% CI:0.73-10.29). Clients aged 20-24 years had 32% reduced odds to be infected with HIV compared with clients aged 15-19 years (cOR: 0.68, 95%CI: 0.06-7.01). Male had increased odds of being infected with HIV as compared to females (cOR: 1.32, 95%CI: 0.58-2.97). Clients who had attained a middle school certificate had a higher prevalence of HIV as compared to clients who had no formal education (cOR: 1.19, 95%CI: 0.19-1.56). Clients with tertiary education were less likely to be infected with HIV compared to clients who had no formal education (cOR: 0.09, 95%CI: 0.03-0.32).

Clients who had a past history of STI were about 3 times more likely to be infected with HIV as compared to those who had no previous history of STI (cOR 2.46 95% CI: 1.33-4.56). Clients who had a past history of Syphilis had 7 times higher odds to be infected with HIV as compared to those with a previous history of vaginal/urethral discharges (cOR:7.23, 95% CI:2.96-17.71). These factors remained significantly associated in the multivariate analysis (aOR: 6.39, 95% CI: 4.14-9.78. Similarly, clients with a previous history of gonorrhea were more likely to be infected with HIV (cOR: 4.24, 95% CI: 1.76-10.24). Also, clients with a

previous history of tuberculosis were 3 times more likely to be infected with HIV compared to those with no previous history of tuberculosis (cOR: 3.12, 95% CI: 1.07-9.03).

Sexual activeness was significantly associated with HIV transmission. Clients having two or more sexual partners were statistically significantly associated with HIV infection. Clients with two or more partners were about 3 times more likely to be infected with HIV infection compared to those with only one partner (cOR: 3.43, 95% CI: 1.79-6.57). This association remained independently significant (aOR: 3.33, 95% CI: 1.16-9.55) in the multivariate analysis when age, sex, educational level, previous history of STI, type of STI, previous history of tuberculosis, sexual activeness, number of sexual partners and HIV testing were adjusted.

Clients who had ever taken voluntarily HIV testing and counseling were 68% less likely to be infected with HIV as compared to those who had never tested for HIV (cOR: 0.32, 95% CI: 0.16-0.63). Also, pregnant women testing for HIV had 71% reduced odds of being HIV infected compared to clients who were referred for HIV testing due to signs and symptoms identified by a clinician (cOR: 0.29, 95% CI: 0.13-0.68).

Table 4.6: Logistic Regression Analysis of Factors Influencing HIV Prevalence in Sunyani

		Unadjusted			Adjusted		
Variable	N	OR	95% CI	P value	OR	95% CI	P value
Age group[c]				<0.001*			0.012*
15-19 (Ref)	15	1.00			1.00		
20-24	65	0.68	0.06-7.01	0.744	0.08	0.002-2.59	0.154
25-29	143	1.05	0.13-8.84	0.962	0.38	0.02-9.19	0.551
30-34	117	1.75	0.21-14.2	0.603	0.23	0.009-5.89	0.377
35-39	56	1.37	0.15-12.7	0.148	0.22	0.007-7.29	0.397
40-44	17	4.31	0.42-43.7	0.217	0.81	0.01-63.98	0.927
45 and above	32	6.36	0.73-10.29	0.093	0.65	0.01-33.34	0.829
Sex[c]				0.508			0.723
Female (Ref)	382	1.00			1.00		
Male	63	1.32	0.58-2.97	0.508	2.38	0.25-22.59	0.449
Educational level[c]				<0.001*			0.922
No Education (Ref)	30	1.00			1.00		
Primary	24	0.66	0.17-2.58	0.547	1.46	0.1-20.89	0.78
JSS	112	0.47	0.17-1.29	0.144	0.16	0.01-1.79	0.137
MSLC	15	1.19	0.29-4.96	0.806	2.46	0.06-103.02	0.636
SEC/TECH	84	0.55	0.19-1.56	0.258	3.22	0.296-34.99	0.337
Tertiary	180	0.09	0.03-0.32	<0.001*	0.27	0.016-4.52	0.359
STI				0.004*			<0.001*
Never had STI	155	1.00			1.00		
Ever had STI	290	2.46	1.33-4.56	0.004*	0.00	0.0001-0.048	<0.001*
STI type				<0.001*			0.123
Vaginal discharges (Ref)	117	1.00			1.00		
Syphilis	29	7.23	2.96-17.71	<0.001*	6.39	4.14-9.78	0.035*
Gonorrhea	31	4.24	1.76-10.24	0.001*	1.58	0.21-2.09	0.661
TB				0.036*			0.262
Never had TB(Ref)	20	1.00			1.00		
Ever had TB	425	3.12	1.07-9.03	0.036*	3.39	0.27-42.01	0.342
Sexual activeness				0.028*			0.666
Never had Sex (Ref)	33	1.00			1.00		
Active in the past month	346	0.25	0.09-0.65	0.004*	0.22	0.04-0.108	0.108
Not active past 1month	66	1.29	0.47-3.5	0.619	0.83	0.09-7.18	0.868
Number of partners				0.025			0.025*
One (Ref)	364	1			1.00		
Two or more	81	3.43	1.79-6.57	<0.001*	3.33	1.16-9.55	0.025*
HIV Testing				0.001*			0.03*
Never tested	377	1.00			1.00		
Ever tested	68	0.32	0.16-0.63	0.001*	0.33	0.08-1.35	0.124
Referral				0.001*			0.581
Diagnostic HIV(Ref)	71	1.00			1.00		
Walk in VCT	128	0.91	0.42-1.99	0.814	2.12	0.38-3.98	0.395
PMTCT	246	0.29	0.13-0.68	0.004*	3.60	0.67-19.65	0.139

[c]: Known Confounders, *: Statistically significant, Ref: Reference, VCT: Voluntary Counseling and Testing, PMTCT: Prevention of Mother to Child Transmission

CHAPTER FIVE

DISCUSSIONS

The findings of this study demonstrated that out of 445 clients interviewed, 46 of them were HIV reactive representing a prevalence of 10.3% (95% CI: 7.82-13.54). All the 46 clients who tested positive for HIV had started antiretroviral treatment. About 13 out of the 46 positive clients (28%) of HIV reactive clients who accessed HIV counseling and testing services during the period of the study as shown in Table 4.3 were from districts far away from Sunyani. Some of them were from Goaso Municipal, Berekum Municipal, Asunafo South, Asutifi North, Dormaa Municipal, Tano North and Tano South districts. This could be attributed to fear of stigma HIV patients experience from community members (Foust & Kaspar, 2010) People living with HIV are ignored, discriminated and shunned by the community, peers and family. Also, some people living with HIV encounter improper treatment at work which affects them psychologically (Saki, Kermanshahi, Mohammadi, & Mohraz, 2015). As a result, people most vulnerable to HIV are reluctant to access HIV counseling and testing services in the health facility closer to their place of residence and work. This could be a reason people travel from that far distance to access HIV testing and counseling services in Sunyani Municipal as revealed in this study.

The mean age of clients accessing HIV testing and counseling services in the Sunyani Municipality during the period of the study was 30.8years (SD ±8.5years). Majority of the clients were females, which could be due to the Prevention of Mother to Child Transmission of HIV program which mandates every pregnant woman to be tested for HIV during pregnancy. The lower proportion of males is likely as a result of poor health-seeking behaviour of men. Similarly, previous findings suggest that men in comparison to women do not utilize treatment services and fail to seek early health interventions in Ghana (Azu, Richter, & Aniteye, 2018).

According to the UNAIDS in 2014, new cases of HIV that occurred in 2015, 58% occurred among adolescent young women. The majority of HIV/AIDS cases in the world is 60% more likely to be young people (UNAIDS, 2014). In this present study, age was significantly associated with HIV transmission with a higher proportion of HIV reactive clients within the age group 30-34 years. A higher proportion (38/46) representing 83% of HIV reactive clients in this study were females. Across the study participants, there was a significant difference in age, occupational status, marital status, and educational level, and HIV transmission. Findings from a study in seven countries in Sub Sahara Africa suggested that people who have attained secondary education or higher have lower HIV prevalence (Harling & Bärnighausen, 2016). Similarly, this present study found that tertiary education was significantly associated with HIV infection and people with tertiary education are 91% less likely to have HIV infection as compared to those with no formal education.

Previous testing for HIV is significant predictors of HIV prevalence in this present study. Morbidities and mortalities related to HIV can be reduced and controlled early enough if people know their HIV status and start early treatment. Most people living with HIV are highly infectious in the early stage of the disease; however, most of these people are unaware of their HIV status until later when disease condition has worsened (Oppong Asante, 2013). Several studies have indicated that about 40% of the world population are not aware of their HIV status immunosuppression (Castilla et al., 2002; Oppong Asante, 2013; UNAIDS, 2016; WHO, 2016). Also, most late testers of AIDS are more likely to die shortly after diagnosis due to immunosuppression (Castilla et al., 2002; Oppong Asante, 2013). In this present study, there was a significant difference in HIV status with regard to a history of HIV testing. Most (85%) of the respondents had ever tested for HIV and knew their HIV status. The majority (85%) who had ever tested for HIV and know their status can be explained by the higher proportion of pregnant woman (55%) who may have been tested for HIV at antenatal registration and retested

for HIV at 34 weeks or attending antenatal for their subsequent pregnancies. Prevention of Mother to Child Transmission of HIV is a program in Ghana that aims to screen every pregnant woman during antenatal to be able to put in intervention capable of preventing HIV transmission from an HIV positive mother to her infant during pregnancy, labour, delivery or breastfeeding. In Ghana, every pregnant woman is tested at antenatal registration and at 34 weeks of pregnancy to screen for HIV during pregnancy. Also, several Know Your HIV (KYS) campaigns have been organized in the Sunyani Municipality and this could be attributed to the higher proportion of HIV clients with a previous history of testing for HIV and aware of their HIV status. The WHO and UNAIDS have indicated that 70% of the people living with HIV know their status, however, the World Health Organization aims that 90% of the World population should know their HIV status by 2020 for early initiation of antiretroviral treatment (UNAIDS, 2016; WHO, 2017). In this present study, the majority of the clients were aware of the signs and symptoms of HIV which confirms the high proportion of the respondents accessing HIV counseling and testing services. Out of the 68 people who had never tested for HIV, 15 (22.1%) tested positive for HIV indicating that many people with HIV infection were unaware of their status. Referrals for HIV testing were significantly associated with HIV prevalence. Out of those who walk in for HIV counseling and testing, 20 (15.6%) tested positive for HIV, 14(6%) pregnant women tested positive for HIV while 12 (16.9) who were referred due to STI, TB etc. tested positive for HIV.

In this study, a previous history of sexually transmitted infection was significantly associated with HIV transmission. Similarly, several studies have indicated that having unprotected sex, sharing contaminated needles, syringes, accidental needle stick injuries, blood transfusion, inconsistent condom, alcohol consumption are known factors associated with the prevalence of HIV (Delva & Abdool Karim, 2014; Ncube et al., 2012; Chimoyi et al., 2015; WHO, 2016).

In this study, most of the respondents indicated that injuries from infected sharps and needles, blood transfusions and sexual intercourse are known the cause of HIV transmission. Though there was no statistically significant difference between condom use and HIV infection, this study revealed that most (55%) of the clients sometimes use condoms with about 36% who had never used condoms during sexual intercourse. The majority 29(63%) of the HIV reactive clients sometimes use condoms while 14 (30.4%) of HIV reactive clients had never used condoms during sexual intercourse. However, a few 2 (4.3%) of HIV positive clients were regular users of condoms. This confirms the WHO statement that condoms are highly effective for the prevention of HIV and other sexually transmitted infections when used correctly and consistently (WHO, 2018).

In this study, having multiple sexual partners was significantly associated with HIV transmission. Other studies reported that multiple sexual partners, a history of genital ulcers among men in the past 12 months were associated with HIV infection whereas a history of unusual vaginal discharge in the past 12 months was significantly associated with HIV infection (Omori & Abu-Raddad, 2017; Pettifor et.al., 2005). Having multiple sexual partners is a contributory factor to having sexually transmitted infection. Having unprotected sex increases the risk of contracting HIV infection. This present study revealed that a previous history of syphilis and gonorrhea were significantly associated with HIV transmission. Similarly, a study in Brazil stated that clients with the previous history of sexually transmitted infection such as syphilis and gonorrhea have a higher risk of being infected with HIV (Clínicas et al., 2012). The previous history of syphilis and gonorrhea were more likely to have higher HIV prevalence compared with those with urethral or vaginal discharges. The previous history of STI and the type of STI previously contracted proved to be significant factors associated with HIV prevalence in the Sunyani Municipality. Similarly, other studies (Lang et al., 2018)

indicated that having STI increases the chance of getting infected with HIV since a previous history of STI indicates that unprotected sex has occurred.

In this study, it was evident that clients with a previous history of tuberculosis are more likely to have higher HIV prevalence and this was statistically significant. However, this does not mean that people with TB or previous history of TB will get HIV unless these people are engaged in activities such as unsafe sex or other risky activities that may expose them to HIV infection.

Age was a significant predictor of HIV transmission in this study. Older clients (45 and above years) were about 7 times more likely of having higher HIV prevalence compared to those <19 years of old. Increasing in age makes an individual more prone to infections. The World Health Organization has indicated that HIV is more prevalent in younger adults as compared to older adults in the World (WHO, 2017b). However, the Ghana HIV Sentinel Survey, 2016 indicated that HIV prevalence is higher among women aged 45-49 years than women 15-19 years old (Ghana AIDS Commission, 2017). There were a higher proportion of HIV reactive clients aged between 25-34 years old in this study which is consistent with WHO findings which indicates that HIV is common among younger adults (WHO, 2016).

There was evidence in this study that sexual activeness is a significant predictor of HIV prevalence. Several kinds of literature have reported that sexually active men have a higher prevalence of HIV compared to sexually inactive men (Hwang et al., 2013; Mayaphi et al., 2018; Pettifor et al., 2005). This is likely due to the fact that sexually active men are more likely to have engaged in sexual activities as compared to sexually inactive men. About 21.2% of HIV positive clients indicated that they have never had sex but were HIV reactive. These clients may have acquired HIV through blood transfusion and through mother to child.

Limitations

Limitations in this study were possibly recalled bias and the client's perception of stigma associated with HIV. Recall bias was anticipated to some extent since clients had to remember their previous history of sexually transmitted infection, previous history of tuberculosis, previous testing for HIV and previous use of condoms. This error was minimized by using local calendar listing the main national and religious events and other timelines as well as symptoms of the infections.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The proportion of HIV positive clients in Sunyani Municipality was 10.3%. Out of the 46 HIV positive clients, 13 of them representing 28% reside in districts far away from the Sunyani Municipality. The study revealed that knowledge of HIV in the Sunyani municipality is high. The factors that were significantly associated with HIV prevalence in the Sunyani were age, a previous history of STI, type of STI previously contracted, sexual activeness, previously tested for HIV, referral for HIV testing, previously contracted tuberculosis and number of sexual partners.

6.2 Recommendations

Based on the findings from this study, the following recommendations were made,

Municipal Health Directorate

- Should target and sustain effective prevention interventions such as health education and behavioral change communication. These interventions should target age-specific groups to prevent new infection across all age groups.
- Should scale up and prioritize STI clinics in the Sunyani Municipality for HIV cascade of care within the context of 90-90-90 goal to end AIDS by 2020.
- Should prioritize interventions such as Know your HIV status in high burden sub-districts as well as low burdened sub-districts to sustain HIV control.

Ministry of Health

- HIV programmes and TB-control programmes should ensure that there is sufficient capacity to deliver health care and effectively implement and scale up collaborative TB/HIV activities
- All stakeholders of collaborative TB/HIV activities, including HIV programmes and TB-control programmes, should support and encourage operational research on district/region-specific issues on tuberculosis, STI and HIV to develop the evidence base for efficient and effective implementationn of collaborative TB/HIV activities.

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APPENDIX

Appendix I: Information Sheet

Project Title: Factors associated with HIV prevalence in Sunyani municipality

Institutional Affiliation: School of Public Health, College of Health Sciences, University of Ghana, Legon. Telephone: 0208437190

Email address: karhinwiredu@live.com

Background: The principal investigator is Kingsley Arhin-Wiredu, a student of the School Of Public Health, conducting a research on factors associated with HIV prevalence in Sunyani municipality. This study is solely for academic purposes and requirement for the award of Master of Public Health degree. The project is under the supervision of Dr. Bismark Sarfo of the school of public health, University of Ghana, Legon.

Procedure: Information will be collected on basic socio demographic data, knowledge on HIV, transmission risk factors and prevention.

Possible risk and discomfort: There are no risks associated with your participation in this study, however it will require about 15 minutes of your time to ask you some questions concerning HIV. Also, some clients may be emotional in recounting their experiences

Possible benefits: There will be no direct benefit for participating in this study. However, you will significantly contribute to our understanding of the key factors associated with HIV and how best to address these factors in order to successfully control the spread of the disease in the Sunyani municipality. This will not affect your services seeking schedules.

Confidentiality: Information provided by participants will be kept safe and cannot be trace to you, except the team involved in the research of this study. This will be done using codes or numbers in place of participant's names. We will not reveal your names or identity in any of

our reports or papers. All recodes will be kept in a secured place with the principal investigator and accessible only by research team members

Compensation: There is no compensation for participants in this study.

Voluntary Participation and right to leave the research: You have the right not to take part in the study if you do not want to, and be assured that your non participation will not affect you in anyway. If you have enrolled in the study, you may also decide to leave at any point in time without penalty, and you will not be affected in any way.

Before you consent:

Do you have any questions you wish to ask? You are free to ask any question now, later or any time you wish to seek clarification on anything concerning the research. Please do not hesitate to contact the principal investigator (Kingsley Arhin-Wiredu) on telephone number 0208437190 or send an email to karhinwiredu@live.com. You may also contact my academic supervisor on 0269343169. For further information on this study you can contact Hannah Frimpong **(**GHS-ERC Administrator): Mobile: 0243235225 or 0507041223. Email: Hannah.Frimpong@ghsmail.org

Abena Kwaa (Assistant GHS-ERC Administrator):0244712919

E-mail: nanatuesdaykad@yahoo.com

Appendix II: Participant Informed Consent

I ……. (**Patient id or code**) have been adequately informed about the purpose, procedure, potential risks and benefits of this study. I have had the opportunity to ask questions and the questions have been answered to my satisfaction. I know that I can refuse to participate in this study without any loss or benefit to which I would have otherwise been entitled to. Having gone through the consent form thoroughly, I agree to enroll in this study.

Participant Signature/ Right thumbprint …… Date …….

Witness Signature …… Date …….

Interviewer statement

I have explained the procedure to be followed in this study to the client in the language that he/she understands best and he/she has agreed to participate in the study.

Researcher:

……

Signature of interviewer ……

Date…….

Appendix III: Structured Questionnaire

Counselling interviews (People Testing for HIV)

DD …….. MM …….. YY…….

Date of Interview: ...../...../.....

Interview Location: .....

Form No: .....

Introduction and Consent

Hello my name is Kingsley Arhin-Wiredu, and I am working on **Factors associated with HIV prevalence in Sunyani municipality**. We are conducting a study to help reduce the prevalence of HIV in Sunyani municipality. We would like to ask you a few questions on factors associated with HIV. Your opinions are very important to us. Your answers will be kept confidential and your name will not be written on the survey so there will be no possibility to identify you. Your participation in this study is voluntary and you can withdraw from the interview at any moment without any negative consequences for you.

This will take about 30 minutes of your time. Do you have any questions?

Do you agree to take part in this study?

Signature of Interviewer: .....

Name of interviewer: .....

For: Clients accessing HIV counselling and testing services

We kindly request that you answer the following questions as truthfully as possible, all the answers that you provide are anonymous

	A. DEMOGRAPHIC DATA			
	QUESTIONS	CODING CATEGORIES	SKIP TO	CODES
1.	Age of respondent			AGE
2.	Sex of respondent	Male ……1 Female ……0		SEX
3.	Occupation			OCCUP
4.	Status of occupation	Unemployed ……0 Full Time …….....1 Part Time …….2		STAT_OCCUP
5.	Education	None …….. 0 Primary ……. 1 JSS ……. 2 MSLC ……..... 3 SEC/TEC ……... 4 Tertiary ……..…… 5		EDU
6.	Marital Status	Married …...…….... 0 Single …… 1 Divorced …...……. 2 Separated ……..…. 3 Widow ……..…… 4 Cohabiting …… 5		MARI_STAT
7.	Religion	Muslim …….0 Christian ……...1 Traditional ……...2 Other …….. 3		RELIGION
8.	Place of Residence			PLC_RES
	B. KNOWLEDGE ON HIV			
9.	Do you know what HIV is?	No …… 0 Yes ……... 1		HIV_CAUSE
10.	Source of information • Radio	No ……...…… 0 Yes ……... 1		SOU_RAD
	• TV	No …… 0 Yes ……...1		SOU_TV
	• Friends	No ……0 Yes ……...1		SOU_FRNDS
	• Health Facility	No ……0 Yes ……...1		SOU_HF
	• Others			SOU_OTH
11.	What in your opinion cause HIV? • Sex	No ……0 Yes ……...1		CAU_SEX
	• Infected sharps and needles	No ……0 Yes ……...1		CAU_INF_SHP
	• Blood transfusion	No ……0 Yes ……...1		CAU_BT
	• Mother to child	No ……0 Yes ……...1		CAU_MOTH_CH

	• Punishment/Curse/Supernatural means	No ……0 Yes ……...1		CAU_PUN_CUR
	• Don't Know	No ……0 Yes ……...1		CAU_DOK
	• Mosquito bite	No ……0 Yes …… 1		CAU_MOSQ_BI
	• Others Specify			CAU_OTH_SPF
12	What are signs and symptoms of someone infected with HIV? • Weight loss	No …… 0 Yes ……... 1		CAU_WL
	• Headache	No …… 0 Yes ……... 1		CAU_HEACH
	• Rash	No …… 0 Yes ……... 1		CAU_RASH
	• Fever	No …… 0 Yes ……... 1		CAU_FVR
	• Diarrhoea	No …… 0 Yes ……... 1		CAU_DRRH
	• Don't Know	No …… 0 Yes ……... 1		CAU_DOK
	• Others Specify			CAU_OTH_SPF
13	How can a person get infected with HIV? • Through sex	No …… 0 Yes ……... 1		CAU_THRU_SEX
	• Needle prick	No …… 0 Yes ……... 1		CAU_NED_PRK
	• Spill of blood	No …… 0 Yes ……... 1		CAU_SPL_BLD

Thank you very much for your time

Appendix IV: Ethical Approval

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghsercc@gmail.com

MyRef. GHS/RDD/ERC/Admin/App 118/071
Your Ref. No.

21st March, 2018

Kingsley Arhin-Wiredu
University of Ghana
School of Public Health
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 082/12/17**
Project Title	Factors Associated with HIV Prevalence in the Sunyani Municipality
Approval Date	21st March, 2018
Expiry Date	20th March, 2019
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra