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SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

FACTORS ASSOCIATED WITH SYPHILIS INFECTION AMONG OUTPATIENTS IN ASIKUMA ODOBEN BRAKWA DISTRICT

BY

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DECLARATION

I declare that except for references to other people's investigations which have been duly acknowledged, this dissertation is the result of my own research and that this dissertation either in whole or part has not been presented for another degree elsewhere.

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DEDICATION

This Dissertation is dedicated to my parents, Mr. and Mrs. Kan-iri for their care and support

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ABSTRACT

Introduction: Syphilis is a sexually transmitted infection which is still a global public health concern. It affects both sexes and all ages but mostly prevalent among the sexually active age group (15-49 years). It results in diverse complications and also promote the contraction of other sexually transmitted infection including the potential of increasing the risk of contracting HIV/AIDs by two to five folds. Its prevalence in developed countries is far lower compared to developing counties. The HIV/AIDs Sentinel Survey indicated that Asikuma Odoben Brakwa district in the Central region has consistently recorded the highest prevalence in the country.

Objective: To determine the prevalence and factors associated with syphilis infection among outpatients 15-49 years in Asikuma Odoben Brakwa district.

Methods: A descriptive cross-sectional study design was used in thirteen (13) randomly selected health facilities. Two hundred and seventy-seven (277) patients aged 15-49 years presenting at the Outpatient Departments were enrolled into the study. Blood samples were taken and tested for syphilis infection and a questionnaire was administered to determine the factors associated with the disease. Data were analyzed with Stata version 14.

Results: The overall prevalence of syphilis was 3.2% (9/277), with 5.7% (6/105) and 1.7% (3/172) among males and females respectively. Significant factors associated with syphilis include sub-district of residence, ($\chi2$ (4) = 31.20, $p<0.001$), history of coerced sexual intercourse ($\chi2$ (1) = 8.79, $p=0.003$), and having more than one sex partner within the past year ($\chi2$ (2) = 8.54, $p<0.014$).

Conclusion: Syphilis is more prevalent among male patients and generally high in patients who live in rural areas. Having a history of coerced sex and having more than one sex partner within a year increases an individual's chance of contracting syphilis infection in Asikuma Odoben Brakwa district.

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LIST OF ABBREVIATIONS

AOB	Asikuma Odoben Brakwa
CDC	Centers for Disease Control and Prevention
CHPS	Community Based Health Planning and Services
CS	Congenital Syphilis
DHD	District Health Directorate
DHMT	District Health Management Team
FTA-ABS	Fluorescent Treponemal Antibody Absorption
GAC	Ghana AIDS Commission
GHS	Ghana Health Services
IM	Intramuscular
IV	Intravenous
MOH	Ministry of Health
MSM	Men who have Sex with Men
OPD	Outpatient Department
RPR	Rapid Plasma Reagin
SDHMT	Sub-district Health Management Team
STI	Sexually Transmitted Infections
TPHA	Treponema pallidum Haemagglutination Assay
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

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DEFINITION OF KEY TERMS

Chancre: The typical painless ulcer of syphilis

Congenital syphilis: Syphilis present in utero and at birth and occurs when a child is born to a mother with syphilis

Dementia: A broad category of brain disorders that lead to a long term and often gradual decrease in the capacity to think and remember that is great enough to affect a person's daily functioning

Incidence: Occurrence of new cases of disease that develop in a population over a specified time period

Neurosyphilis: Syphilis of the brain and/or the spinal cord

Outpatient: A patient who receives medical treatment without being admitted to a hospital

Prevalence: Proportion of a population having a specific characteristic in a given time period

Seropositivity: Giving a positive result in a test of blood serum

Seroprevalence: Proportion of persons in a population who test positive for a specific disease or disorder based on blood serum specimens

Sexually Transmitted Infection: An infection that can be transferred from one individual to another individual through sexual intercourse

Stillbirth: The birth of a baby who is without any signs of life at or after 24 weeks of pregnancy

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CHAPTER ONE

1.0: INTRODUCTION

1.1: Background to the Study

Syphilis is an ulcerative infection that remains a major global public health problem (Mutagoma et al., 2016). It affects both sexes, all age groups and even those yet to be born, but most prevalent among the most sexually active age group (15-49 years) of the population.

In 2012, the global estimate of syphilis was 18 million (Newman et al., 2015). Even though a successful test for syphilis has been available since the early part of 1900s and effective treatment has been widely available since the 1940s, over 10 million people worldwide acquire the disease every year and more than 90% of these cases occur in developing countries (Trope et al., 2014).

According to the Centers for Disease Control and Prevention (2015), 63,450 cases of syphilis were reported out of which 19,999 were primary and secondary (P&S) syphilis, the earliest and most transmissible stages of syphilis in the United States.

In Ghana, statistics on the prevalence of syphilis in most studies focus on pregnant women attending ANC in public health facilities. The HIV sentinel surveys is one such study conducted at designated sites across the country. In 2008, the mean syphilis prevalence among pregnant women was reported to be 6.6% in the Ghana. At the same time Asikuma Odoben Brakwa district recorded the highest prevalence (15.5%) in the country with Cape Coast metropolis and Akim Oda occupying second and third place respectively (Ghana AIDS Commission [GAC], 2008).

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1.1.2: Mode of Transmission

Syphilis infection is spread from one person to another by direct contact with a chancre (syphilis sore). Chancres usually occur on the external genitals, vagina, rectum, anus, lips and in the mouth. Transmission takes place during vaginal, oral or anal sex (Centers for Disease Control and Prevention, 2014).

Syphilis can also be transmitted when contaminated blood is transfused to a patient who was free of disease and in pregnant women, mothers who have syphilis can transmit it vertically to their unborn foetus. This takes place in the uterus via the placenta and usually begins within the 10th to 15th weeks of gestation or during the period of delivery resulting in congenital syphilis (Centers for Disease Control, 2014). It is estimated that 80% of maternal syphilis infection will lead to severe adverse pregnancy outcomes including abortions, stillbirths, premature births, neonatal death, or congenital malformations in the newborn (Kamb et al., 2010). Major individual risk factors that promote the transmission of syphilis include men who have sex with men (MSM), having concurrent multiple sex partners, alcohol/drug use and engaging in unprotected sexual intercourse (Park et al., 2016).

The incubation period of syphilis ranges from 10 to 90 days with an average period of 21 days (Centers for Disease Control, 2014).

1.1.3: Clinical Manifestations of Syphilis

Syphilis is called "The Great Pretender" because the signs and symptoms it presents look like many other diseases. However, syphilis progresses through different stages, each of which has unique clinical manifestations (Ivars Lleó, Clavo Escribano, & Menéndez Prieto, 2016). These are primary, secondary and tertiary stages.

The Primary stage of syphilis is characterized by the appearance of a single chancre, however, there may be multiple chancres in other situations. The location of the chancre

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is the spot where the bacteria (*Treponema pallidum*) enter the body. The chancre is usually firm, round, small, and painless and since chancres are typically painless and can occur inside the body, a person might not notice it. The chancre disappears in about 3 to 6 weeks whether or not a person is treated (Centers for Disease Control, 2014).

Secondary syphilis presents rashes on the skin and mucous membranes lesions which are usually found in the mouth, vagina or anus. The rashes usually appear on one or multiple sites of the body. They can appear when the primary chancre is healing or several weeks after the chancre has healed. In some cases the rash begins from the trunk but eventually covers the entire body. The rashes may look like rough, red, or reddish brown spots on the palms of the hands and soles of the feet which are not itchy and may be accompanied by wart-like sores in the mouth or genital area. Sometimes rashes associated with secondary syphilis are so faint to be noticed. Syphilis is also characterized by large, raised, gray or white lesions, called condyloma lata, which usually develops in warm and moist areas such as the mouth, underarm or the groin region. In addition to rashes, swollen lymph nodes, fever, patchy hair loss, sore throat, weight loss, headaches, muscle aches, and fatigue. Symptoms of secondary syphilis will resolve either with or without treatment, but without treatment, the infection will progress to the latent and late stages of the disease.

The latent stage which is known as the "hidden stage" is the period between the secondary stage and tertiary stage characterized by disappearance of primary and secondary symptoms (Ivars, Clavo & Menéndez, 2016). According to Linhares, Jorge, Bernardes and Fonseca (2016), it is a stage where the infected individual continue to have the disease with no signs and symptoms which can last for one year. This is called the early latent syphilis, whiles the late latent syphilis infection occurs when the infection is beyond 12 months.

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The tertiary stage of syphilis can occur in about 15% of people who have not been successfully treated for syphilis, and can appear 10 to 20 years after infection was first acquired. At this stages, the disease may damage the internal organs such as the brain, heart, blood vessels, nerves, eyes, liver, bones, joints etc. Symptoms may include difficulty in muscle coordination, numbness, paralysis, dementia and gradual blindness which may be serious enough to cause death. (Centers for Disease Control and Prevention, 2015).

1.1.4: Clinical Manifestation of Congenital Syphilis

The syphilis bacterium can infect the baby of a woman during pregnancy and depending on how long the pregnant woman has been infected, she may have a high risk of having a stillbirth. It is document that depending on severity of infection, the outcome of syphilis infection in pregnancy on the foetus is late spontaneous abortion (20%-40% of cases), stillbirth (20%-25%) and 15%-55% of the cases ends up in congenital syphilis (Rodríguez-Cerdeira & Silami-Lopes, 2012). A baby who is infected with syphilis may be born alive without any sign or symptom of the disease, but if not diagnosed and treated instantly, may develop severe complication of syphilis within a short time (Jamal et al., 2015). The most common outcome is death, occurring in 40% to 70% of pregnancies where mothers did not get appropriate treatment (Rodríguez-Cerdeira & Silami-Lopes, 2012).

Infants that are infected usually have rhinitis with mucus rich in treponemes but may be clear, purulent or bloody. Chondritis may be present with consequent destruction of nasal cartilage and laryngeal involvement that may results in a cry that sounds hoarse (Carles et al., 2008). Maculopapular skin lesions develop in 30% to 60% of infants and are usually similar to those of adult secondary syphilis. Ulcers and scabs develop later which are highly contagious (Antaya & Robinson, 2010). The early signs of nervous

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system involvement are hydrocephalus and meningitis, which may lead to mild to severe mental retardation and psychomotor disorders. The best known pulmonary complication is proliferative diffuse interstitial pneumonia which is technically known as pneumonia alba (Carles et al, 2008). The kidneys are affected and even in the absence of neurologic symptoms there may be abnormalities in the cerebrospinal fluid as well as the destruction of bone tissue that may cause pain and fractures leading to pseudoparalysis of the affected limbs (Simms & Broutet, 2008)

1.1.5: Diagnosis of Syphilis

Syphilis is diagnosed through blood test which falls into two main categories. These are Nontreponemal tests and Treponemal tests. Treponemal tests are simple, inexpensive and are not specific for syphilis because they can produce false-positive results. They include the Veneral Disease research Laboratory (VDRL) and Rapid Plasma Reagin (RPR) and First Response Syphilis Anti-TP Card Test (Centers for Disease Control and Prevention, 2015).

Treponemal tests detect antibodies that are specific to syphilis. Examples are Fluorescent treponemal antibody absorption (FTA-ABS) test, Treponema Pallidum Haemagglutination Assay (TPHA) test, chemiluminescence immunoassays, immunoblots, and rapid treponemal assays. Treponemal antibodies appear earlier than nontreponemal antibodies and usually remain detectable for life, even after successful treatment. (Centers for Disease Control and Prevention, 2015). Diagnosis of congenital syphilis is based mainly on ultrasound findings of characteristic signs, such as hepatosplenomegaly, hydrops fetalis with scalp edema, placental enlargement, and polyhydramnios (Rodríguez-Cerdeira & Silami-Lopes, 2012).

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1.1.6: Treatment for Syphilis

Though there are no home medications or over-the-counter drugs to cure syphilis, it is easy to treat in its early stages. Benzathine penicillin G (2.4 million units) administered intramuscularly in a single dose is the drug of choice for the treatment of syphilis in the primary and secondary stages (Hayes et al., 2010). For penicillin allergic persons, doxycycline (100mg orally twice daily for 14 days) or tetracycline (500mg four times daily for 14 days) are the drugs of choice.

In latent and tertiary syphilis, three doses of penicillin G (7.2 million units, administered as three doses of 2.4 million units IM each at one week interval) are required to treat syphilis. For neurosyphilis aqueous crystalline penicillin G (18-24 million units per day, 3-4 million units IV every four hours or continuous infusion, for 10 to 14 days) is recommended. Treatment kills *Treponema pallidum* and prevent further organ damage, however, it does not repair damage already done (Centers for Disease Control and Prevention, 2015). Persons who receive syphilis treatment must abstain from sex with new partners until the chancres are completely healed. In infants with proven or highly probable congenital syphilis, aqueous penicillin G 100,000 to 150,000 IU/kg/day (50 000 IU/kg IV every 12 hours during the first seven (7) days of life and every 8 hours thereafter for 10 days) or procaine penicillin G (50,000 IU/kg in a single IM injection for 10 days) is needed.

1.1.7: Prevention of Syphilis

Persons who have syphilis must inform their sex partners so that they can also be tested and treated if necessary. Having syphilis infection before does not confer immunity to a person against subsequent infections. Even following successful treatment, people can be reinfected. Unless a person knows that their sex partners have been tested and treated, they may be at risk of being reinfected by an untreated partner. The surest

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way to avoid contracting syphilis is to abstain from sex or to be in a trusted long-term mutually monogamous relationship with a partner who has been tested and is known to be disease free. Correct and consistent use of condoms can reduce the risk of syphilis only when the infected area or site of potential exposure is protected. Syphilis sores outside of the area covered by condoms can still permit transmission, so care should be taken even when condom is used. Blood to be transfused should be screened before used to prevent transfusing contaminated blood to patients (CDC, 2015). Transmission of syphilis cannot be prevented by douching, urinating and washing the genitals after sex.

1.2: Problem Statement

In 2008, syphilis prevalence among women attending antenatal clinic in Ghana was 6.0% (World Health Organization, 2008), with the highest prevalence of 15.7% reported from the Central region (GAC, 2008).

Analysis by districts revealed a 30.5% prevalence reported from the Asikuma Odoben Brakwa District (Regional Health Directorate, 2008). Control measures were therefore put in place which led to a significant reduction to 6.5% in 2013, but this figure rose again to 16.7% in 2015 (DHD, 2015).

Though syphilis does not result in frequent mortalities, it is a major risk factor for the transmission of other sexually transmitted infections including gonorrhea, HIV/AIDS, chlamydia, etc. with their own complications.

When syphilis is not identified early and treated, it can lead to long term neurological problems such as meningitis, deafness, blindness, brain damage and dementia. It can also lead to cardiovascular problems including inflammation of the aorta and damage

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to the valves of the heart. Infertility can also occur and in pregnant women, it may lead to miscarriages, stillbirths and congenital syphilis if the baby is lucky to be born alive. The prevalence of syphilis among pregnant women who attend antenatal clinic in the district is therefore known through the HIV sentinel surveys, however, this is just a fraction (4.0%) of the cohort of sexually active women.

The prevalence of the disease in women who are not pregnant but sexually active and their sex partners in the population is not known. There is a need to determine the prevalence of the disease among the sexually active cohort (15-49 years) of the population so that programs could directly target them before the women of that group get pregnant in the first place. This may limit transmission and contribute to reducing congenital syphilis which occur as a result of mother-to-child transmission of the disease.

Also, since the disease continue to persist in the district, it is justifiable to say that there may be challenges inherent in its control as a results of peculiar factors that may be unknown to health professionals. This study is therefore aimed at unearthing these factors that will afford the District Health Management Team (DHMT) and other stakeholders the opportunity to put in more robust strategies to control the disease.

1.3: Justification of the Study

This study will provide a better estimate of syphilis prevalence, the burden of the disease, among the sexually active population in the district. It will also advance the knowledge of health workers about syphilis infection and patient factors associated with it. The report of this study will serve as a reference for future research works on the disease and its recommendations will provide the Asikuma Odoben Brakwa DHMT, SDHMTs, external collaborators and interested parties in health care the opportunity to

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better understand the risk factors associated with syphilis. This will help provide appropriate interventions to control the disease in the district.

1.4: Research Question

What is the prevalence and factors associated with syphilis infection among outpatients aged 15-49 years in Asikuma Odoben Brakwa district?

1.5: Study Objectives

1.5.1: General objective

To determine prevalence and factors associated with syphilis infection among outpatients aged 15-49 years in Asikuma Odoben Brakwa district

1.5.2: Specific Objectives

1. To determine the prevalence of syphilis infection among outpatients
2. To determine factors associated with syphilis infection

1.6: Conceptual Framework

Syphilis infection is determined by two main factors classified as underlying factors and immediate factors. The underlying factors are the sociodemographic factors that interact with the immediate factors of the individual to determine whether an outcome (syphilis) will occur or not. The immediate factors are further divided into exposure factors, preventive factors and factors regarding knowledge about the disease. Coerced sex may be affected by age to a greater extent as grownups above the age of 18 years are less likely to be forced into having sex compared with their younger counterparts who are weak and vulnerable. Also young people are inexperience and have inadequate knowledge about how syphilis is spread as well as matters regarding safer sex practices. As a result they may engage in indiscriminate sex which may lead to high prevalence

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of the disease. Age at sex initiation may be influence by an individual's educational background. Those with high educational background may spend longer time in school studying with little time to think of sex. On the other hand, school dropouts and those who made up their minds not to go to school, may find other alternative which may include engaging in early sex. Young people who live with their parents may be guarded against substance abuse such as alcohol and illegal drugs. This may shape their sexual behaviour and hence reduce the prevalence of syphilis since alcohol and drugs tend to cloud judgement leading to sexual behaviours that they could have disengaged in if they had not been under the influence of alcohol or drugs. The number of sexual partners may be determine by marital status and religion. The traditional and Islamic religions encourage monogamous marriages which may eventually increase the number of concurrent sex partners. This may negatively affect condom use that may result in high prevalence of syphilis. Some Christians who frown against blood transfusion are less likely to be infected by syphilis through blood transfused from an infected person hence, the prevalence will reduce.

Disclosure of one's STI status to a partner is more likely in a marital relationship than in those who are not married. Those who are not married and are in untrusted relationships may refuse to reveal their disease status to their sex partners for them to also seek treatment together that will break the chain of transmission. Occupation of an individual may play a very important role in syphilis infection especially in women. Those who have no jobs may be compelled to have sex with men in order to get money to cater for themselves compared to women who are self-sufficient. People with good jobs are more likely to pay for services such as screening for early detection and treatment of syphilis compared with those who cannot afford food, however, such people with low moral values are likely to have multiple sex partners because some

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ladies in particular engage in sexual relations with men as a result of financial reasons. They also have wider social networks which may end up in sexual activities. Well educated people may have high level of knowledge about syphilis through both electronic and print media. Knowledge on how the disease is caused, transmitted and prevented may help people take precautionary measures that may reduce the prevalence compare with those who are ignorant.

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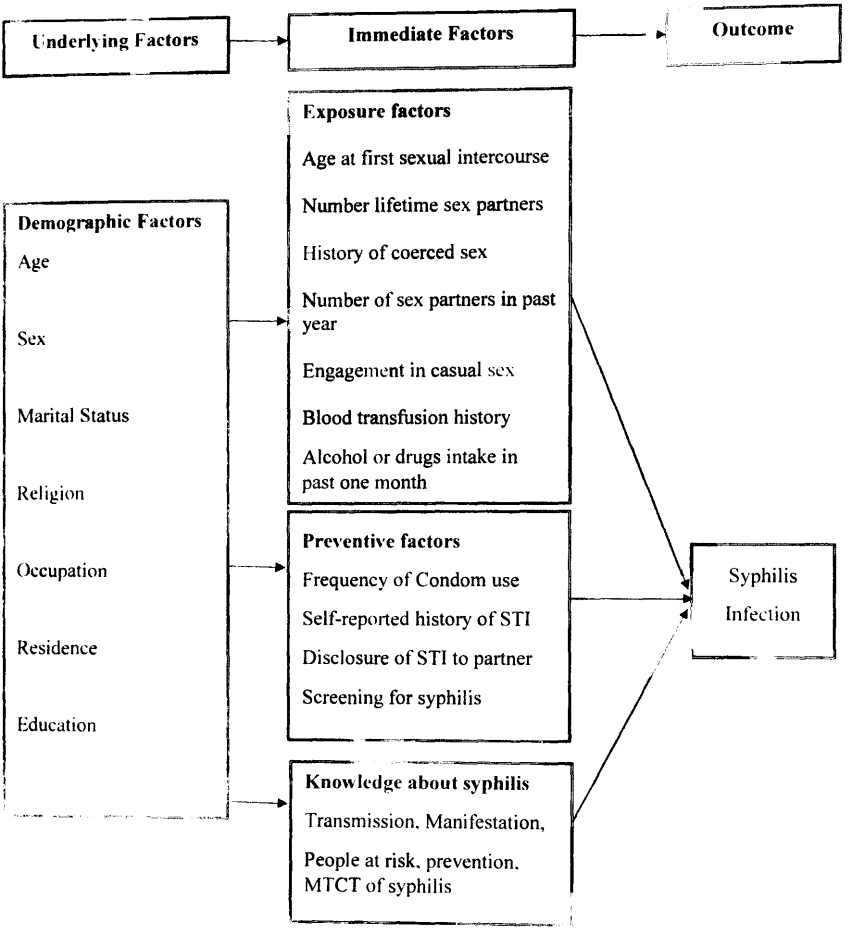

Fig. 1: Conceptual Framework on Factors Associated with Syphilis Infection

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CHAPTER TWO

2.0: LITERATURE REVIEW

2.1: Origin of Syphilis

It is believe that syphilis disease was introduced into Europe in 1493 by the crew returning from Christopher Columbus's first expedition to America. The first well-recorded European outbreak of what is now known today as syphilis occurred in 1494 when it broke out among French troops besieging Naples (Knell, 2004). It is also believed that the French might have been infected through Spanish mercenaries who were serving King Charles of France in that siege (Lobdell, Owsley & Harrison, 1974). From there, the disease swept across Europe affecting a lot of people at that time. According to Zeina (2007), "when syphilis was first recorded in Europe in 1495, its rashes often covered the body from the head to the knees, caused flesh to fall from people's faces, and led to death within a few months". Additionally, unlike today syphilis was very fatal then.

Syphilis was seen as public health concern by the 16th century even though treponema pallidum, the causative organism that cause syphilis was discovered by Fritz Schaudinn in 1905.

According to Brath (2006), August Von Wassermann was the first to develop blood reaction test to diagnose syphilis and in 1913, Hideyo Noguchi demonstration revealed the presence of Treponema pallidum in the brain of paralytic patients working in the Rockefeller University.

He proved that Treponema pallidum was the cause of syphilis by successfully culturing it using the brains of patients who had died from general paralysis (Roberts & Emsley, 1992)

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Prior to Noguchi's discovery, syphilis had been a burden to humanity in many lands. Without its cause being understood, it was sometimes misdiagnosed and often misattributed to damage by political enemies. In 1909, another German bacteriologist; Paul Ehrlich discovered the first effective treatment, an arsenic-containing compound, Salvarsan (a historic proprietary name for asphenamine). The antibiotic penicillin, which is still the preferred treatment, was shown to be highly effective against the disease since 1943 (Kelly, 2009).

1.2: Causative Organism for Syphilis

Syphilis is caused by a gram negative bacterium called *Treponema pallidum*, which belongs to the family spirochaetaceae. Three subspecies that cause syphilis (Treponema pallidum pallidum, Treponema pallidum endemicum and Treponema pallidum pertenue) are all morphologically indistinguishable and have an approximate diameter of 0.18 μm and length of 6-20 μm. Other species of the genus Treponema include; Treponema pallidum subspecies pertenue, which causes yaws, Treponema pallidum subspecies endemicum, the causative organism of endemic syphilis (also called bejel) and Treponema carateum, which also causes pinta (Brooks, Butel & Morse, 2004). Apart from their morphology which is now possible, the pathogenic treponemes cannot be distinguished by antigenic, biochemical, or genetic criteria. Differentiation of the treponematosis however is based on their geographical location, modes of transmission, and clinical manifestations. Similarities in treponemal infections include their generalized nature, regional and general lymphadenopathy, chronicity, spontaneous healing, asymptomatic periods, and relatively painless symptoms. Although specific strain differentiation is not available, different human isolates have been characterized. These isolates exhibit various degrees of virulence as determined by animal inoculation

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studies. During blood transfusion, blood infected with the bacteria can also transmit the infection to the one receiving the donated blood (Albrecht et al, 1996).

2.3: Prevalence of Syphilis in the General Population

Syphilis has become a global public health concern most especially in developing countries. About 10.6 million new syphilis infections were recorded globally with many of these cases occurring in poor countries (World Health Organization, 2012). It is also estimated that globally, 11 million cases of syphilis occurred in 2008 with majority of the cases occurring in Southern Asia and Sub-Saharan Africa (Gottlieb et al., 2014). In a study to estimate the global prevalence and incidence of four common curable sexually transmitted infections by Newman et al. (2015), the prevalence of syphilis was estimated to be 0.5% with 0.2% in the African region which was lower than a similar study in Pakistan where prevalence of syphilis was 8.9% (Kazi et al., 2010).

In China, syphilis prevalence was 0.36% (Chen et al., 2010) compared with 0.031% recorded in Liguria region in Italy (Drago et al., 2014). A study among the population of 15-49 years in Rwanda reported prevalence figures around 0.9% (Mutagoma et al., 2016) which was lower compared with a study that assesses the disparities in HIV and syphilis prevalence and risk factors between older male clients with and without steady sex partners in southwestern rural China where syphilis prevalence was 3.2% (Chen et al., 2017). It was also found to be 0.5% among men who have sex with men. In a study to determine the burden of HIV, syphilis and hepatitis B and C among inmates in a prison state in Mexico, the overall prevalence of syphilis was 0.7%, with 1.6% among females compared to 0.6% among males (Belaunzaran-Zamudio et al., 2017). In Kenya, a study by Otieno-Nyunya et al., (2011), revealed 1.8% prevalence among the general population which is far lower than 8.5% prevalence revealed among the general population of Cape Coast in the Central region of Ghana (Metropolis, 2015).

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Several studies were also carried out into the prevalence of syphilis among special groups of people. For example, among women of reproductive age in Swaziland, 1.4% prevalence of syphilis was found in a study that assesses the risk factors associated with sexually transmitted infections (Ginindza et al., 2017). Also, among drug users in Russia, prevalence of syphilis was extremely high, ranging from 8% in Moscow, 20% in Volgograd and 6% in Barnaul (Rhodes et al., 2006). In Nepal, an assessment of sexual risk behaviours showed that the prevalence of syphilis in female commercial sex workers was 3.9% (Kakchapati et al., 2017), whiles in Beijing (China), 19.8% prevalence was reported among Men who have sex with Men (Freeman & Justice, 2009). This was due to the several factors such as inconsistent condom use, sharing of needles and blood products and exchange of drugs. In Ghana, the prevalence of syphilis was found to be 11% among prison inmates and 8.5% among prison officer in Nsawam (Adjei et al., 2006).

Regarding the general sex distribution of syphilis, there is no fix trend as some studies reported high prevalence among females compared to males whiles other studies reported the opposite. For instance, a prevalence study on HIV and syphilis among indigenous people in the Brazilian Amazon revealed a 2.23% and 1.51% prevalence of syphilis among men and women respectively (Benzaken et al., 2017). A similar trend was observed in another prevalence study in a reference center in Brazil where a much higher prevalence of syphilis (7.5%) in males compared to 4.3% in females was seen (Gomes et al., 2017).

On the contrary, other studies recorded high prevalence in females compared to males. For example, a 3.5% and 3.9% prevalence were observed in males and females respectively in a population-based survey in the African Sub-region (World Health

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Organization, 2012). In a prevalence study in Coastal Peruvian Cities, a prevalence of 1.5% and 2.0% were recorded males and females respectively.

Even though syphilis is usually prevalent among the 20-29 age group, a facility-based study examined the distribution of syphilis among inpatients in Wenzhou (China), and found a high prevalence among patients older than 80 years. The least prevalence was observed among those aged 20-39 years (Xu et al., 2016).

2.4: Prevalence in Pregnant Women

A lot of work on the prevalence of syphilis among pregnant women are well documented worldwide due to the effects of the disease among this group. In 2008, about 1.36 million pregnant women globally were estimated to have syphilis infection; of these, 80% had attended Antenatal care. It was also estimated that 520,905 adverse pregnancy outcomes were caused by maternal syphilis. These adverse outcomes include 212,327 stillbirths and early fetal deaths, 65,267 preterm births, 91,764 neonatal deaths and 151,547 congenital syphilis (Newman et al., 2013). In 2012, it was estimated that 6.2% and 9.7% of global neo-natal deaths and stillbirths respectively were due to untreated maternal syphilis (Herbert, Middleton & Herbert, 2012). Their evidence was further strengthened by the findings of a joint report from the World Health Organization and the Regional Office of South-East Asia (SEARO) in 2009. Their report revealed variations between 1.11% and 3.90% of maternal syphilis among regions of the World Health Organization. The report depicted a prevalence of 3.90% for the American Region, 1.98% for the African Region and 1.50% for the European Region. It also showed a prevalence of 1.48% for South-East Asia, 1.11% for the Eastern Mediterranean Region and 0.70% for Western Pacific Region (World Health Organization, 2009).

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In Mayotte in Indian, a study among pregnant women revealed a prevalence of 2.1% (Saindou et al., 2012) which was a bit higher than1.6% recorded in similar research conducted in 2008 on HIV-1, HSV 2 and syphilis among pregnant women in rural Tanzania (Yahya-Malima et al., 2008). In Nigeria, syphilis prevalence among women (20-45 years) attending antenatal clinic in 2007 was 2.97% (Taiwo, Adesiji & Adekanle, 2007), which was very low compared with 7.0% and 3.0% prevalence reported in the Ashanti region and Kumasi township respectively in Ghana ((Dassah, Adu-Sarkodie & Mayaud, 2015). In a study to estimate the divergent spatial patterns in the prevalence of the HIV and syphilis in South African pregnant women, the mean prevalence of syphilis was 3.2%, 2.3% and 2.2% for 2007, 2008 and 2009 respectively (Manda, Lombard & Mosala, 2012).

In a study to determine correlates of syphilis seropositivity and risk for syphilis-associated adverse pregnancy outcomes among women attending antenatal care clinics in the Democratic Republic of Congo, a 4.2% prevalence was recorded. It was also observed that syphilis seropositivity was significantly higher among women attending rural clinics (5.0%) as compared to 3.0% among those attending urban clinics (Taylor, 2014).

The HIV/AIDs sentinel survey in Ghana by the Ghana AIDs Commission also showed a trend of syphilis in Asikuma Odoben Brakwa district to range from 5.6% in 2004, 3.6% in 2005, 3.1% in 2006 and 3.8% in 2007 (GAC, 2007). Thereafter, subsequent year's findings showed very high prevalence figures from 14.5% in 2008, 8.4% in 2009 through to 1.6% in 2015 after the district had embarked on rigorous intervention measures targeted specifically at controlling syphilis infection (GAC, 2009).

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2.5: Prevalence of Congenital Syphilis

According to Newman et al.,(2013), approximately 1.36 million pregnant women globally were estimated to have syphilis infection of which 151,547 ended up in congenital syphilis in 2008 (Newman et al., 2013). In the United States of America, it was estimated that the overall prevalence of reported congenital syphilis cases decreased from 10.5 to 8.4 cases per 100,000 live births during 2008–2012, and then increased to 11.6 cases per 100,000 live births in 2014, the highest CS rate reported since 2001(Jamal et al., 2015).

The estimated annual numbers of cases of congenital syphilis varied by the proportion of cases of maternal syphilis estimated to develop congenital syphilis. For example, according to Hayes, et al (2010), the estimated number of cases of congenital syphilis was 728,547 annually. Among infants, congenital syphilis increased by 23%, from 8.2 cases per 100,000 live births in 2005 to 10.1 during 2008 following a 38% increase in primary and secondary syphilis rate among females aged 10 years from 2004 to 2007 (Dis, 2016).

In the United Kingdom, it was reported that the number of babies with syphilis was 1.9 per 100,000 but still anticipate that many more cases of congenital syphilis were seen (Simms & Broutet, 2008).

It was estimated that the likelihood of vertical transmission of syphilis in mothers with the disease is between 45% and 75%. As a result, the number of congenital syphilis cases varies annually from 700 thousand to 1.5 million and an estimated 420 000 to 600 000 perinatal deaths occur. About 40% of deaths correspond to stillbirths and about 20% of live neonates fail to survive; the remaining 20% live, diagnosed with congenital syphilis (Rodríguez-Cerdeira & Silami-Lopes, 2012). In a study in Valera in Venezuela on syphilis prevalence among pregnant women, it was observed that in every 39

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maternal syphilis cases 85% of their babies develop congenital syphilis (Vásquez-Manzanilla et al., 2007). Also, in a study to determine the prevalence and factors associated with syphilis in parturient women in Northeast Brazil in 2009, it was revealed that congenital syphilis prevalence was between 0.2 to 5.8 per 1000 live births (Araújo et al., 2013).

2.6: Factors Associated with Syphilis Infection

Though syphilis is predominantly transmitted through sexual intercourse, several factors are associated with it. These factors are not very different from factors associated with other sexually transmitted disease like HIV/AIDS and gonorrhea. In a study to determine the prevalence of syphilis infection and its associated factors in the general population of Rwanda, it was revealed that the strongest predictors of syphilis infection were being HIV-positive, which was associated with an adjusted odds ratio (aOR) of 4.2, and having concurrent sexual partners, which was associated with an aOR of 4.2 (Mutagoma et al., 2016). The study also showed that people with secondary and higher education have a lower probability of testing positive compared with those with lower education. Overall, there was a slightly higher syphilis prevalence among women (OR of 1.0) than among men (OR 0.8) (Mutagoma et al., 2016). A study by Sarkodie et al (2016), indicated a high prevalence of syphilis among people who lived in Kumasi (urban) compared to those who outside Kumasi (rural). According to the study, urban dwellers are 1.16 times more likely to contract syphilis infection compared to their rural counterparts. According to Araújo et al., (2013), parturient women who had their first sexual relation when they were less than 15 years of age were at a higher risk of developing syphilis than those who initiated sexual activities when they were 15 or older. This shows that early initiation of sexual activity may favour the exposure to sexually transmitted diseases including syphilis. The findings also showed that those

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with more than one sex partners are more likely to contract syphilis compared to those with just one partner.

In a study on factors associated with sexually transmitted infections (STI) among young Ghanaian women by Ohene & Akoto (2008), revealed that women who have no history of sexually transmitted infection were less likely to know where to get condoms (37%) but more likely to use a condom at their last sexual encounter (27% vs 17%). Also women who admitted they had STI were significantly less likely to discuss family planning with their sex partners but more likely to have two or more sex partners in the preceding 12 months. Based on that, it was finally concluded that factors associated with sexually transmitted infections among sexually active Ghanaian female youth involved not knowing where to secure condoms and not discussing family planning or condom use with sex partners. The proportions of the respondents from the two groups who reported alcohol use by themselves and/or their partners before sex, were about the same statistically.

A study by Upchurch & Kusunoki (2004), observed a significant association between history of coerced sexual intercourse and sexually transmitted diseases. It was revealed that girls who reported a history of coerced sexual intercourse were 1.39 times more likely to contract STIs including syphilis compared to girls who reported no history of coerced sexual experience. This study was also supported by findings by a study in South Africa which identified coerced sex to have a strong effect on inconsistent condom use. It was concluded that women who reported that their most recent partner forced them were 5.77 times more likely to be inconsistent condom users with that same partner (Pettifor, Measham, Rees, & Padian, 2004). Also, a study of risk factors associated with syphilis incidents in a cohort of high-risk men in Peru, indicated that men who have sex with men were associated with higher risk of incident syphilis

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infection (IR 6.48). Other factors that were significantly associated were not being in a stable relationship (IR 1.56), having higher number of sex partners within the past year (IR 3.01), having unprotected sexual intercourse (IR 0.56; and HIV infection (IR 6.26). The study also revealed that not having stable work was associated with higher risk of syphilis infection (IR 1.67) (Park et al., 2016).

According to Qin et al (2016), there is association between other sexually transmitted infections (STIs) especially HIV/AIDS, for example syphilis infection was reported to be high prevalence among men who sleep with men (Ohene & Akoto, 2008) due to high HIV infection among them. In another study on the associated factors with syphilis among human immunodeficiency virus-infected men who have sex with men in Taiwan, participants who used recreational drugs such as alcohol were less likely to use a condom during sex. There is also evidence that suggest a significant association between recreational drug use and the frequency of acquiring syphilis (Chang et al., 2014).

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CHAPTER THREE

3.0: METHODS

3.1: Study Design

A descriptive cross-sectional study was carried out in one district hospital (Our Lady of Grace Hospital), three health centres (Asikuma, Odoben, Brakwa) and nine CHPS compound (Amanfong, Ahwiam, Sowutuom, Jamra, Domeabra, Bedum, Nankese, Ayipey, fosuansa) in the district. Patients aged 15-49 years presenting to the health facilities whom upon being seen by a clinician, orders a laboratory test for them were consecutively enrolled into the study. Finger prick blood samples were collected from the patients. A portion of the sample was used to perform a Rapid First Response Syphilis Anti-TP Card Test. Confirmatory Treponema pallidum Haemagglutination Assay (TPHA) test was performed on samples that were found reactive to the First Response Syphilis Anti-TP Card test. Data were also collected from the patients on patient factors associated with syphilis infection which include educational level, alcohol consumption, number of sex partners, marital status, history of STI, history of blood transfusion and age at first sexual encounter. Data were also collected on occupation, history of coerced sex and disclosure of STI status to sex partner. Data were further captured on factors relating to knowledge about syphilis infection such as mode of transmission, categories of people at risks, signs and symptoms and preventive measures. Data were collected in the offices of field technicians and community health officers using a structured questionnaire, which were administered one-on-one to patients who had taken the syphilis test.

3.2: Study location

Asikuma-Odoben-Brakwa District is located in the north-central portion of the Central Region bordered on the North by Birim South District of the Eastern Region, on the

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South by Ajumako-Enyan-Essiam District, the West by Assin North and Assin South Districts and to the East by the Agona East District (DHD, 2015).

The district covers a land area of about 884.84 sq km constituting 9% of the total land area of the Central Region. The district has a total population of 131,298 which include 30,199 WIFA, 5,252 children 0-11 months and 26,259 children 0-59 months. The population growth rates for urban and rural areas are 4.0% and 2.3% respectively. A little over forty eight percent (48.17%) of the population are males whiles 51.83% are females. The district has 245 settlements with 65% of the populace living in the rural and remote areas.

The district is divided into four sub-districts namely Asikuma, Odoben, Brakwa and Anhwiam with only three urban centres which include Breman Asikuma, Agona Odoben and Breman Brakwa.

There is one mission hospital which serves as the district hospital and a referral centre for three health centres, 20 CHPS compounds and one maternity home in the district and other nearby facilities outside the district. There are 10 Medical Doctors, 5 Physician assistants, 345 nurses of all categories, 8 Laboratory staff, 7 technical officers and 3 Field technician. There are 160 Community-based agents and 45 traditional birth attendants providing services to augment the efforts of the formal health system. Our lady of grace hospital is the only facility rendering both Outpatient and inpatients hospital and serves as a referral facility for the health centres and the CHPS compounds. The district's annual OPD cases were 177453, 151434 and 164915 for 2013, 2014 and 2015 respectively. A total of 7434 patients were admitted whiles 187 patients died.

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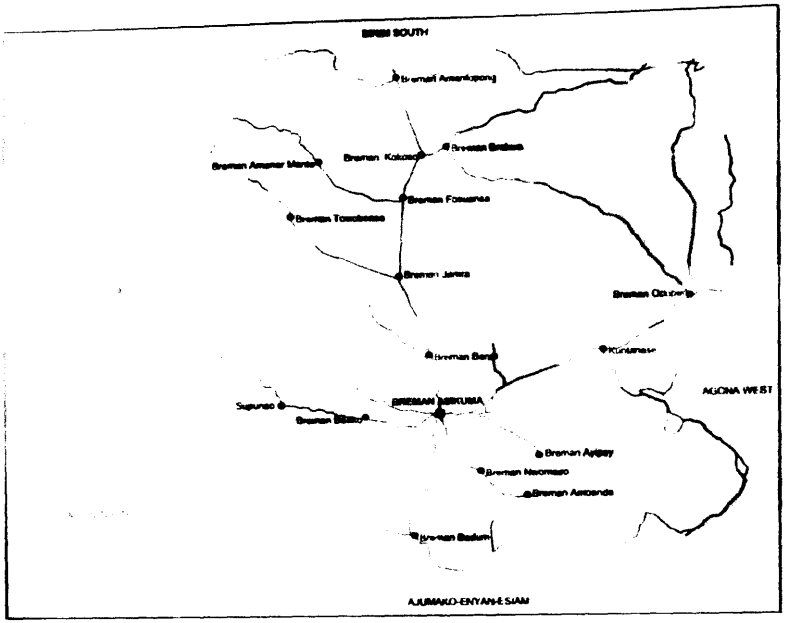

Fig. 2: Map of Asikuma Odoben Brakwa District

3.3: Study Variables

The main dependent variable of the study is syphilis infection. The independent variables include demographic characteristics such as age, sex, marital status, occupation, educational level, residence and sub-district. It also includes variables regarding sexual behaviour profiles such as condom use, where to get condoms, number of sex partners, history of blood transfusion, alcohol use and general knowledge about syphilis infection.

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Operationalization of Study Variables

Table 1: Definition and Operationalization of Variables

Variable	Definition	Characteristics	Scale of measurement
Dependent Variable			
Syphilis infection	Status of an individual regarding syphilis infection in the population. Categorized as "yes" if individual test positive for syphilis and "no" if individual test negative for syphilis	Categorical (Dichotomous)	Nominal
Independent Variables			
Age	Age at last birth day (yrs.)	Numeric	Ratio
Sex	Biological makeup of the individual (male, female)	Nominal	Nominal
Marital status	Marital status (single, married, divorced/separated)	Nominal	Nominal
Occupation	Work of respondents (farming, artisan, students, trading, public servant, other)	Nominal	Nominal
Residence	Place of stay (urban, rural)	Nominal	Nominal
Educational level	Educational status (no formal education, basic education, secondary education, tertiary education)	Ordinal	Ordinal
Subdistrict	Subdistrict where respondent reside (Asikuma, Odoben, Brakwa, Anhwiam, outside district)	Nominal	Nominal
Age at first sex	Age at first sexual intercourse (years)	Numeric	Ratio
Condom use	Condom use at first sexual encounter (yes/no)	Nominal	Nominal
Frequency of condom use	Frequency of condom use (always, very often, rarely, very rarely, not at all)	Ordinal	Ordinal
Where to obtain condom	Knowledge about where to obtain condom (yes/no)	Nominal	Nominal
Number of sex partners	Number of sex partners in the past year (no sex partner, 1partner, 2 and more partners)	Numeric	Ratio
History of blood transfusion	Blood transfused history (yes/no/don't know)	Nominal	Nominal

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Variable	Definition	Characteristics	Scale of measurement
Alcohol use	Alcohol consumption before sexual intercourse within last 3 months (yes/no)	Nominal	Nominal
Syphilis screening test	Self-reported participation in syphilis screening programme (yes/no)	Nominal	Nominal
History of STI	Self-reported history of STI (yes/no)	Nominal	Nominal
Coerced sex	History of coerced sexual (yes/no)	Nominal	Nominal
Knowledge of sex partner	Knowledge of sex partner (yes/no)	Nominal	Nominal
Disclosure of STI	Disclosure of STI to partner (yes/no)	Nominal	Nominal
Knowledge about syphilis infection	Ever heard about the syphilis (yes/no)	Nominal	Nominal
	Categories of people affected (everybody, only children, only adults, don't know)	Nominal	Nominal
	Clinical manifestation (genital ulcer, skin lesions, rashes, fever, rash, don't know)	Nominal	Nominal
	Mode of transmission (sexual intercourse, kissing, blood transfusion, don't know)	Nominal	Nominal
	Mother to child transmission (yes/no)	Nominal	Nominal
	Prevention of syphilis (yes/no)	Nominal	Nominal

Syphilis prevalence was measured as a proportion (in percentage) and was computed as:

(The total number of respondents who tested positive for syphilis infection /The total number of respondents tested for syphilis infection) *100.

Patient factors associated with syphilis infection were measured as proportions and a Chi-square test was used to determine their association with the dependent variable (syphilis infection). The strength of association of factors that were significant in the Chi-square test were determined using simple and multiple logistic regression.

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3.4: Sample Size Determination

Sample size was determined using the formula $N = z^2pq/d^2$. (Cochran, 1963) where:

z is the critical value corresponding to 95% confidence level (1.96)

p is the proportion of syphilis in the population = 16.7% or 0.167), (DHD, 2015)

q is the power which is 1-p, =1-0.167 = 0.833

d is the margin of error which is 0.05

Therefore substituting the values into the formula we have:

$(1.96^2 * 0.167 * 0.833)/0.05^2 = 217$

The minimum sample size required for this study is 217 subjects. However, to adjust for 10% non-response rate, (0.1* 217) + 217 resulted in a sample size of 239. The assumption for using this formula is that the proportion of syphilis among patients aged 15-49 year seeking outpatient services in the district is the same as the proportion of syphilis among pregnant women seeking antenatal care in the district. Ten percent (10%) non-response rate was chosen because the study involved taking of blood samples and hence comes with anxiety of being tested positive for syphilis. It was therefore anticipated that this may result in a substantial number of patients withdrawing from the study at some point in the data collection process. Field assistants filled in responses for subjects in the questionnaire and therefore no incomplete data were recorded.

3.5: Sampling Method

A multistage sampling technique involving four stages was used in this study. At the first stage, simple random sampling was used to select 13 health facilities out of the twenty six (26) health facilities in the district. Names of all facilities were written on pieces of papers, folded and put in a box and shaken vigorously for them to mix thoroughly. Thirteen (13) pieces of papers were picked from the box and facilities that

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are picked were included in the study. At the end of this process, one district hospital (Our Lady of Grace Hospital), three health centres (Asikuma, Odoben, Brakwa) and nine CHPS compound (Amanfong, Ahwiam, Sowutuom, Jamra, Domeabra, Bedum, Nankese, Ayipey, fosuansa) were selected for the study.

At the second stage, stratified sampling was used to determine the number of study subjects needed from each of the selected health facilities. This was done by computing the proportions of outpatient cases that were seen in each of the selected facilities in 2015. This proportion was calculated as the total number of outpatient cases in each of the selected health facility divided by all outpatient cases from the 13 selected facilities put together. The proportion calculated for each facility was then multiplied by the total sample size (277) to get the number of subjects needed from each of the selected facilities.

The third stage was simple random sampling and was done at the facility level. Patients presenting at OPD on each day within the data collection period was assigned numbers. These numbers were written on pieces of papers, folded and put in a box and one of the papers was drawn from the box to get the first subject who served as the starting point for next stage.

At the fourth stage and final stage, consecutive enrollment of subjects was done, i.e. the patient next to the first subject was chosen as the second subject and the patient next to the second subject was chosen as the third subject. Random sampling and consecutive enrollment were done each day at the facility level until the total sample size of the study was obtained.

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3.6: Data Collection Method

Patients were tested for syphilis using First Response Syphilis Anti-TP test kit followed by Treponema pallidum Haemagglutination Assay (TPHA) test to confirm samples that were reactive.

The First Response Syphilis Anti-TP test is designed to determine whether or not an individual has syphilis but does not look for the bacteria that causes syphilis. Instead, it checks for the antibodies the body makes in response to antigens produced by cells damaged by the bacteria. The test was carried out using finger prick blood from the individual.

Treponema pallidum Haemagglutination Assay (TPHA) test is a treponemal test for the serologic detection of antibodies to the various species and subspecies of pathogenic Treponema. Serum containing antibodies to pathogenic treponemes reacts with gel particles sensitized with sonicated T. pallidum, Nichols strain (the antigen), to form a smooth mat of agglutinated gel particles in the microtiter tray well. If antibodies are not present, the particles settle to the bottom of the tray well, forming a characteristic compact button of unagglutinated particles. It is used to confirm the reactive results of a nontreponemal screening test for syphilis, such as the First Response Syphilis Anti-TP test and Venereal Disease Research Laboratory (VDRL) test.

3.6.1 Sample Collection for First Response Syphilis Anti-TP Test

The finger tip of the patient was cleaned with an alcohol swab and allowed to air dry. The tip of the finger was squeezed and pierced with a sterile lancet. The sample pipette was then used to draw blood by gently squeezing its bulb after the open end of the pipette was immersed in the finger pricked blood. Pressure was released gently on the bulb of the pipette to draw blood into the sample pipette.

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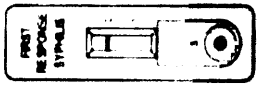
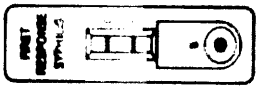
3.6.2 Test Procedure for First Response Syphilis Anti-TP Test

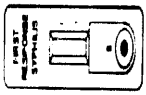
The First Response Syphilis Anti-TP Card Test kit components were brought to room temperature. The test device was removed from the foil pouch and placed on a flat, dry surface. One drop (20 µl) of whole blood in the sample pipette was added to the sample well in the test kit followed by 3 drops (70 µl) of assay diluent to the sample well. This was observed for development of coloured bands in the result window after 20 minutes. The results were interpreted as specified below.

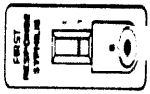


Apperance of one colour band at the control line 'C' as in the figure, indicates a non-reactive/negative syphilis test



Two colour bands, one at control line 'C' and the other at the test line 'T' as in the figure, indicates a reactive/positive syphilis test.





If no colour bands appear, at control line 'C' as in the figure, within the stipulated time indicates invalid test

Fig. 3: Interpretation Guide for Syphilis Anti-TP Test

3.6.3: Specimen Collection and Preparation for TPHA Test

Five (5) millilitres of blood sample was collected from each patient through venipuncture at Our Lady of Grace Hospital laboratory by qualified laboratory technicians. About 200 µl of blood samples were added to labelled ethylenediaminetetraacetic acid (EDTA) test tubes to prevent coagulation. The blood samples were centrifuged and the plasma collected and frozen at -15°C. After that 1µl of blood sample was added into a test tube to obtain sera that was used for Treponema palladium Haemagglutination Assay (TPHA) test confirmation.

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3.6.4 Test Procedure for TPHA Test

Three wells of a microtitration plate was allowed to reach room temperature before use. 190 µl of diluent was added to well one (1) followed by 10 µl of serum. A micropipette was used to mix the contents of well 1 after which 25 µl of the mixture was transferred to well 2 and well 3. Contents were shaken gently and test and control cells were resuspended. 75 µl of control cells were added to well 2 and well 3, shaken and allowed contents to mix thoroughly. The plate was covered and protected from direct sunlight, heat and any source of vibration and then were incubated 45 to 60 minutes at room temperature. The results were read and interpreted using the criteria below.

Table 2: Criteria for Determining Degree of Agglutination

Degree of Agglutination	Reading	Interpretation
Agglutinated particles spread out covering the bottom of the well uniformly	2+	Reactive
Definite large ring with rough multiform outer margin and peripheral agglutination	1+	Reactive
Particles concentrated in the shape of a compact ring with a smooth and round outer margin	±	Indeterminate
Particles concentrated in the shape of a button in the center of the well with smooth round outer margin	-	Non-reactive

3.7: Data Collection Technique

Contacts were made with subjects at the laboratory and rationale of the study explained to them. Interested patients were given pretest counselling before taking their blood samples for the syphilis test. Qualified laboratory staff took blood samples from patients who agreed to take part in the study. At the health centres and the CHPS compounds,

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staff with adequate knowledge on the use of First Response Syphilis Anti-TP Card test performed the test. Post-test counselling was offered to all patients tested. Patients who were tested were interviewed by field assistants using a questionnaire. For subjects who do not understand English language, questions were framed in the local language for their comprehension and appropriate response. Interview with each subject lasted for a maximum period of 7 minutes.

3.8: Data Collection Instrument

Two data collection instruments were used in the study. A laboratory test form was designed to capture data of the syphilis test. It contained unique identification code for each patients tested. Each health facility was given a different code. For easy identification and tracking of subjects for treatment, the laboratory test form also contained fields that captured the name, the test results and the telephone number of each subject. A questionnaire was also used in the study to capture the demographic characteristics of subjects and factors associated with syphilis infection. The questionnaire contained an introductory statement that briefly explained the rationale of the study and a code field to capture the code of the subject as recorded on the laboratory test form.

3.9: Data Processing

Data from fieldwork (hardcopies) were collected and checked for content completeness and accuracy by ensuring that all fields were properly filled in and data recorded in them make meaning. Codes on questionnaire were also cross-checked with those in the laboratory test form to ensure consistency and to ensure they were from the right health facility. This was done daily by the principal investigator and incomplete questionnaires were set aside. After all questionnaires were received from the field, counting was done to ensure that the expected number was obtained. Data entry sheets were designed in

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Microsoft Excel where options per each question were provided for selection during data entry in order to prevent typographical errors. Quality control checks were put in place to ensure that text were not entered in fields solely meant for numbers and vice versa. Appropriate validation rules and procedures were also built into the system. Final designed excel sheets were shared with five data entry assistants who are very proficient in working with Microsoft excel. Filled questionnaires were divided among the five data entry assistants and entered into the designed excel sheets. When all entries were done. softcopies were collected by the principal investigator and crosschecked for accuracy and completeness. The five softcopies were merged to obtain a single file which was also merged with the laboratory test results sheet to obtain the complete excel dataset.

3.10: Data Analysis/ Statistical Analysis

The complete excel dataset obtained after data processing was imported into Stata 14 for statistical analysis. Frequency distributions were computed on the syphilis test results for subjects as either positive or negative and proportions determined to measure the prevalence of syphilis infection. Chi-square test of association with 5% significance level was used to determine factors associated with syphilis infection. Factors that were statistically significant in the chi-square test were assessed using logistic regression to determine the strength of association with the dependent variable (syphilis infection).

3.11: Quality Control

Health staff who had adequate practical knowledge about syphilis test were trained as field assistants at the District Health Directorate on how to administer questionnaires to subjects. The training was facilitated by the principal investigator (PI) and focused more on questioning skills. All sections of the questionnaire were discussed with field assistants after which a practical session was held where each field assistant was tasked

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to administer the questionnaire to his/her colleague. Through this process, shortfalls in framing questions were identified and corrected. The questions were also translated into Fante (local language) and translated back to English language to ensure consistency. Field assistants were also taught how to seek consent and assent from subjects before embarking on data collection. Syphilis tests and questionnaires were pre-tested on thirty patients in two health facilities (Baako CHPS and Eduosia CHPS) in the district which were not part of the actual study. Questions that were so sensitive and not clear were revised. Data quality control checks were also built into excel sheets and in Stata by the PI. Samples for First Response Syphilis Anti-TP Card test and TPHA test were done immediately at room temperature of 25°C to prevent contamination and exposure to adverse temperature.

3.12: Ethical Consideration

Ethical approval was obtained from the Ghana Health Service Ethical Review Committee (Protocol ID NO: GHS-ERC 21/12/16). This institutional review board was chosen because the study was carry out in health facilities under the authority of Ghana Health Service.

3.13: Study Area Approval

Approval was obtained from the research unit of the Central Regional Health Directorate for the study to be carried out in the region. A letter recommending the study from the Regional Director of Health Services was sent to the District Director of Health Services for further approval. Permission was also obtained from members of the DHMT, especially the HIV/AIDs and STI coordinator and the four Subdistrict Health Management Teams to allow their facilities and staff to be used for the study as well as approving for data to be released and used as literature for the study. Special

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approval was obtained from the Management of Our Lady of Grace Hospital, for their laboratory and staff to perform the confirmatory test.

3.14: Subjects Involved in the Study

Patients aged 15-49 years seeking OPD services in health facilities within Asikuma Odoben Brakwa district were enrolled into the study. This group of people were chosen because they are the most sexually active group and hence mostly at risk of being affected by syphilis.

3.15: Inclusion Criteria

All patients aged 15-49 years seeking outpatient services and consenting to participate in the study were included.

3.16: Exclusion Criteria

1. Patients who were critically ill and hence required emergency services were excluded.
2. Patients below 15 years and those above 49 years were also excluded from the study.
3. Patients who had already participated in the study and revisited the health facility at the period of data collection were also excluded.

3.17: Potential risks/benefits of the study

This study involves collection of blood samples from subjects which may cause pain, bleeding and infection. These were however, mitigated by using sterile needles and applying pressure at the site where samples were taken. The benefits of this study to subjects was that it provided opportunity for them to know their status. Subjects who tested negative were counselled and motivated to remain negative by adopting precautionary measures whiles subjects who tested positive were treated free of charge

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by the Asikuma Odoben Brakwa District Health Directorate. For the health system, knowledge of health staff were enhanced about syphilis and therefore provided opportunity for more robust strategies to control the disease.

3.18: Consenting and Assenting Process

Consent was sought from subjects before the syphilis tests and questionnaires were administered to them. Subjects gave consent by signing or thumb printing a consent form before data was collected from them. Parents/guardians of subjects less than 18 years consented for their children to take part in the study. Then, their children gave their assent to participate in the study. This was ensured by the PI and field assistants through face-to-face interaction with subjects in the health facilities.

3.19: Privacy/Confidentiality

Tests were done in the laboratory where other patients did not have access to see the blood sample of subjects being taken. At the health centres and CHPS compounds where laboratories are not available, the tests were done in rooms designated as laboratories where other patients were not allowed entry. Samples of subjects were labelled with codes that were known to only staff performing the test. Names of respondents were not indicated on the questionnaires and interviews were conducted on one-on-one basis with subjects. Test results were disclosed to subjects except in cases where the subject involved was below 18 years and came to the hospital with the parent/guardian. In such instance, the result was also disclosed to the parent/guardian with the assent of the subject.

3.20: Data Storage/Security and Usage

Data collected in hardcopies (Laboratory test forms and filled questionnaires) were collected from laboratory staff and field assistants, sealed in an envelope and locked in

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a drawer by the PI. The PI was the only person who had access to the key of this drawer. Softcopies of data entered into Excel sheets and Stata were pass-worded. Hardcopies were burnt and softcopies deleted from computers after data were analyzed and reports written.

3.21: Voluntary Withdrawal

Subjects were informed of their liberty to freely withdraw from the study at any stage. However, only three persons withdrew from the study because they were in a hurry to go to market for shopping. These withdrawals did not affect the results of the study.

3.22: Cost/Compensation/Payment

Subjects were not compensated for participating in the study, however, those tested positive were treated free of charge by the District Health Directorate.

3.23 Conflict of Interest

There is no conflict of interest.

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CHAPTER FOUR

4.0 RESULTS

4.1 Demographic Characteristics of Respondents

A total of 280 patients aged 15-49 years were recruited into the study in May 2017. Data on 277 are presented as three had incomplete data. The ages of respondents ranged between 15 and 49 years with a mean age of 29.02 (±8.72) years. Most of the respondents, 64/277 (23.1%) were within the 25-29 year age group. Females form the highest proportion 172/277 (62.1%) of the respondents in the study. Majority of the respondents 134/277 (48.4%) were single and 122/277 (44.0%) were married while 21/277 (7.6%) were divorced/separated. Most of the respondents were traders and public servants forming a percentage of 25.3% and 24.6% respectively. Few respondents were seamstresses with proportions of 1.8%. A total of 250 respondents (90.3%) were Christians whiles 19 (6.9%) were Muslims. The rest, 8 (2.9%) belong to the traditional religion. Details of demographic characteristics of respondents are presented in Table 3.

A greater proportions of the respondents, 140/277 (50.5%) attained primary education and 63/277 (22.7%) attained secondary education and only 5.1% had no formal education. A higher percentage of respondents, 191/277 (68.9%) are from rural communities. One hundred and two (36.8%) of respondents are from Asikuma sub-district with 8.3% from Anhwiam sub-district. However, 37/277 (13.4%) of respondents resided outside the district but came to seek care in the district. The distribution of respondents sub-district is shown in Fig. 4.

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Table 3: Demographic Characteristics of Respondents (N=277)

Characteristic	Number	Percentage
***Age group (years)**		
15-19	38	13.7
20-24	60	21.7
25-29	64	23.1
30-34	40	14.4
35-39	32	11.6
40-44	19	6.9
45-49	24	8.7
Sex		
Male	105	37.9
Female	172	62.1
Marital status		
Single	134	48.4
Married	122	44.0
Divorced/separated	21	7.6
Occupation		
Farming	58	20.9
Trading	70	25.3
Artisan	16	5.8
Public servant	73	26.4
Student	55	19.9
Seamstress	5	1.8
Religion		
Christian	250	90.3
Muslim	19	6.9
Traditionalist	8	2.9

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Table 4 continued.

Characteristic	Number	Percentage
Educational level		
No formal education	14	5.1
Primary	140	50.1
Secondary	63	22.7
Tertiary	60	21.7
Residence		
Rural	191	68.9
Urban	86	31.1

*Mean age = 29.02 (±8.72) years Range = 15-49 years

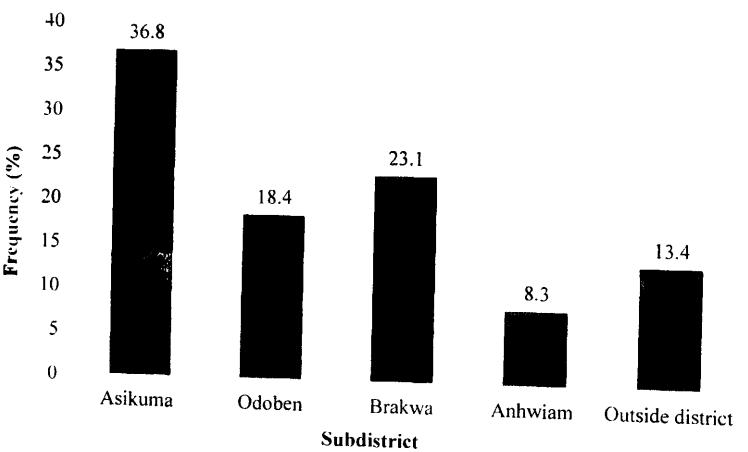

Fig. 4: Distribution of Respondents by Sub-district

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4.2. Prevalence of Syphilis Infection

Out of the 277 outpatients tested, 9 of them were reactive to First Response Syphilis Anti-TP Test. All the 9 (100%) reactive results were positive for the TPHA confirmatory test hence, the overall prevalence of syphilis using both First Response Syphilis Anti-TP Test and TPHA confirmatory test was 3.2% (9/277), (95% CI, 1.7-6.1).

The distribution of syphilis prevalence by demographic characteristics are detailed in Tables 4a and 4b. The ages of respondents with positive test results ranged from 17 to 46 years with a mean age of 31.3 (±11.4) years. The prevalence of syphilis was high (8.3%) among those aged 45-49 years compared to 5.3% in those aged 15-19 years and 40-44 years age groups. The lowest prevalence was among those aged 25-29 years (1.6%).

The prevalence of syphilis was 5.7% in males compared with 1.7% among their female counterparts. The prevalence was 3.0% among those who were single and 4.1% among those who were married. The distribution of syphilis prevalence by occupation showed a 6.3% among artisans, 5.5% among students, 3.4% among farmers, 2.7% among public servants and 1.4% among traders. The prevalence of infection was 5.0% in those who attained tertiary education, 3.2% among those who attained secondary education and 2.9% among those with primary education. The prevalence was 3.7% among those who live in rural areas compared with 2.3% among those living urban areas. In terms of sub-districts, prevalence was 21.7% in Anhwiam sub-district, 5.9% in Odoben sub-district, and 1.0% in Asikuma sub-district.

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Table 5a: Distribution of Syphilis Prevalence by Demographic Characteristics

Characteristic	N (%)	Syphilis test	
		Positive (%)	Negative (%)
Overall (15-49)	**277 (100)**	**9 (3.2)**	**268 (96.8)**
Age group			
15-19	38 (13.7)	2 (5.3)	36 (94.7)
20-24	60 (21.7)	1 (1.7)	59 (98.3)
25-29	64 (23.1)	1 (1.6)	63 (98.4)
30-34	40 (14.4)	1 (2.5)	39 (97.5)
35-39	32 (11.6)	1 (3.1)	31 (96.9)
40-44	19 (6.9)	1 (5.3)	18 (94.7)
45-49	24 (8.7)	2 (8.3)	22 (91.7)
Sex			
Male	105 (37.9)	6 (5.7)	99 (94.3)
Female	172 (62.1)	3 (1.7)	169 (98.3)
Marital status			
Single	134 (48.4)	4 (3.0)	130 (97.0)
Married	122 (44.0)	5 (4.1)	117 (95.9)
Divorced/separated	21 (7.6)	0 (0.0)	21 (100.0)
Occupation			
Farming	58 (20.9)	2 (3.4)	56 (96.6)
Trading	70 (25.3)	1 (1.4)	69 (98.6)
Artisan	16 (5.8)	1 (6.3)	15 (93.7)
Public servant	73 (26.4)	2 (2.7)	71 (97.3)
Student	55 (19.9)	3 (5.5)	52 (94.5)
Seamstress	5 (1.8)	0 (0.0)	5 (100.0)
Religion			
Christian	250 (90.2)	8 (3.2)	242 (96.7)
Muslim	19 (6.9)	1 (5.3)	18 (94.7)
Traditionalist	8 (2.9)	0 (0.0)	8 (100.0)

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Table 4b: Distribution of Syphilis Prevalence by Demographic Characteristics

Characteristic	N (%)	Syphilis test	
		Positive (%)	Negative (%)
Education			
No formal education	14 (5.1)	0 (0.0)	14 (100.0)
Primary	140 (50.5)	4 (2.9)	136 (97.1)
Secondary	63 (22.7)	2 (3.2)	61 (96.8)
Tertiary	60 (21.7)	3 (5.0)	57 (95.0)
Residence			
Rural	191 (68.9)	7 (3.7)	184 (96.3)
Urban	86 (31.1)	2 (2.3)	84 (97.7)
Subdistrict			
Asikuma	102 (36.8)	1 (1.0)	101 (99.0)
Odoben	51 (18.4)	3 (5.9)	48 (94.1)
Brakwa	64 (23.1)	0 (0.0)	64 (100.0
Anhwiam	23 (8.3)	5 (21.7)	18 (78.3)
Outside district	37 (13.4)	0 (0.0)	37 (100.0)

4.3. Knowledge of Respondents on Syphilis Infection.

Respondents were assessed on their knowledge concerning syphilis infection and the results are presented in Table 5. Most of the respondents (88.1%, 244/277) indicated that they had have heard about syphilis, out of these, 148/244 (60.7%) indicated that syphilis affects everybody, 7/244 (2.9.0%) indicated that it affects only children whiles 75/244 (30.7%) indicated that it affects only adults. On clinical manifestation of the syphilis, 90/244 (36.9%) indicated that syphilis manifest as genital ulcers, 8/244 (3.3%) said skin lesion and 27 (11.1%) indicated skin rashes. One hundred and two respondents (41.8%), however, indicated that they did not know any manifestation of the disease. Majority of the respondents, 191 (78.3%) indicated that syphilis is transmitted through sexual intercourse, whiles 7 (2.9%) indicated that the disease is spread through blood

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transfusion. Knowledge of patients on mother-to-child transmission of syphilis indicated that out of the 244 respondents who had heard about the disease, 164 (67.2%) indicated that syphilis could be transmitted vertically from pregnant mothers to their foetus in the womb (congenital syphilis), 29 (11.9%) said it could not be transmitted vertically to the foetus whiles 51(20.9%) had no idea as to whether transmission of the disease is possible or not.

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Table 6: Knowledge on Respondents on Syphilis Infection (N=244)

Characteristic	N (%)	No. positive (%)	95% CI
Ever heard of syphilis disease			
Ever heard	244 (88.1)	6 (2.4)	1.1-5.4
Never heard	33 (11.9)	3 (9.1)	2.8-25.1
People affected by syphilis			
Everybody	148 (60.7)	5 (3.4)	1.4-7.9
Children	7 (2.9)	1 (14.3)	1.6-62.4
Adults	75 (30.7)	0 (0.0)	
Do not know	14 (5.7)	0 (0.0)	
Manifestations of syphilis			
Genital ulcer	90 (36.9)	2 (2.2)	0.5-8.6
Skin lesion	8 (3.3)	0 (0.0)	
Fever	5 (2.0)	0 (0.0)	
Rash	27 (11.1)	0 (0.0)	
Do not know	102 (41.8)	4 (3.9)	1.5-10.1
Others	12 (4.9)	0 (0.0)	
Mode of transmission			
Sexual intercourse	191 (78.3)	2 (1.0)	0.3-4.1
Kissing	8 (3.3)	0 (0.0)	
Blood transfusion	7 (2.9)	2 (28.6)	6.3-70.3
Do not know	36 (14.8)	2 (5.6)	1.4-20.1
Other	2 (0.8)	0 (0.0)	
Mother to child transmission			
Possible	164 (67.2)	6 (3.7)	1.6-8.0
Not possible	29 (11.9)	0 (0.0)	
Do not know	51 (20.9)	0 (0.0)	
Prevention			
Preventable	235 (96.3)	6 (2.6)	1.1-5.6
Not preventable	4 (1.6)	0	
Do not know	5 (2.1)	0	

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Two hundred and thirty-five (235) respondents representing 96.3% said syphilis is preventable. 4 (1.6%) said it is not preventable whiles 5 (2.1%) indicated that they do not know.

4.4.1 Factors Associated with Syphilis Infection

A chi-square test of association between demographic factors and sexual behaviour profiles and syphilis infection was performed and the results are presented in Tables 6 and 7. Although syphilis prevalence was higher (8.3%) among patients 45-49 years age group and 5.3% among those in the 15-19 year and 40-44 year age groups, the association was not significant (χ^2 = 3.84, p=0.698), and therefore not a significant predictor of syphilis infection. Out of the 105 males who were tested, 6 (5.7%) were positive while the rest were negative. Three (1.7%) of the 172 females were positive for syphilis. This association was also not statistically significant (χ^2 = 3.2, p=0.071). Syphilis was more prevalent in patients who were married (4.1%) than in those who were single (3.0%), (χ^2 = 0.01, p=0.602), however, the difference was not significant. Though no significant association was observed, (χ^2 = 2.28, p=0.809), the prevalence of syphilis infection was high 1/16 (6.3%) among artisans and the least prevalence was among traders (1.4%). The prevalence of syphilis was also higher among Muslims 1/19 (5.3%) compared to Christians 8/250 (3.2%), (χ^2= 0.52, p=0.773). Educational level of respondents was not significantly associated with syphilis infection (χ^2= 1.12, p=0.771) and patients with tertiary education had the highest prevalence (5.0%), followed by those with secondary education (3.2%). The least prevalence was seen in patients with primary education (2.9%). Patients living in rural areas had the higher (3.7%) prevalence than their urban counterparts (2.3%). (χ^2= 0.34, p=0.561). Compared with other sub-districts, Anhwiam sub-district had the highest (21.7%) prevalence of syphilis

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infection, followed by Odoben sub-district (5.9%). This association is statistically significant, (χ^2= 31.20, p<0.0001).

Table 7a. Association between Demographic Characteristics and Syphilis Infection

Characteristic	N (%)	Syphilis test		χ^2 (df)	p-value
		Positive (%)	Negative (%)		
Age group				**3.84(6)**	**0.698**
15-19	38 (13.7)	2 (5.3)	36 (94.7)		
20-24	60 (21.7)	1 (1.7)	59 (98.3)		
25-29	64 (23.1)	1 (1.6)	63 (98.4)		
30-34	40 (14.4)	1 (2.5)	39 (97.5)		
35-39	32 (11.6)	1 (3.1)	31 (96.9)		
40-44	19 (6.9)	1 (5.3)	18 (94.7)		
45-49	24 (8.7)	2 (8.3)	22 (91.7)		
Sex				**3.27(1)**	**0.071**
Male	105 (37.9)	6 (5.7)	99 (94.3)		
Female	172 (62.1)	3 (1.7)	169 (98.3)		
Marital status				**1.01(2)**	**0.602**
Single	134 (48.4)	4 (3.0)	130 (97.0)		
Married	122 (44.0)	5 (4.1)	117 (95.9)		
Divorced/separated	21 (7.6)	0 (0.0)	21 (100.0)		

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Table 6b: Association between Demographic Characteristics and Syphilis Infection

Characteristic	N (%)	Syphilis test		χ^2 (df)	p-value
		Positive (%)	Negative (%)		
Occupation				**2.28(5)**	**0.809**
Farming	58 (20.9)	2 (3.4)	56 (96.6)		
Trading	70 (25.3)	1 (1.4)	69 (98.6)		
Artisan	16 (5.8)	1 (6.3)	15 (93.7)		
Public servant	73 (26.4)	2 (2.7)	71 (97.3)		
Student	55 (19.9)	3 (5.5)	52 (94.5)		
Seamstress	5 (1.8)	0 (0.0)	5 (100.0)		
Religion				**0.52(2)**	**0.773**
Christian	250 (90.2)	8 (3.2)	242 (96.7)		
Muslim	19 (6.9)	1 (5.3)	18 (94.7)		
Traditionalist	8 (2.9)	0 (0.0)	8 (100.0)		
Education				**1.12(3)**	**0.771**
No formal education	14 (5.1)	0 (0.0)	14 (100.0)		
Primary	140 (50.5)	4 (2.9)	136 (97.1)		
Secondary	63 (22.7)	2 (3.2)	61 (96.8)		
Tertiary	60 (21.7)	3 (5.0)	57 (95.0)		
Residence				**0.34(1)**	**0.561**
Rural	191 (68.9)	7 (3.7)	184 (96.3)		
Urban	86 (31.1)	2 (2.3)	84 (97.7)		
Subdistrict				**31.20(4)**	**<0.001**
Asikuma	102 (36.8)	1 (1.0)	101 (99.0)		
Odoben	51 (18.4)	3 (5.9)	48 (94.1)		
Brakwa	64 (23.1)	0 (0.0)	64 (100.0		
Anhwiam	23 (8.3)	5 (21.7)	18 (78.3)		
Outside district	37 (13.4)	0 (0.0)	37 (100.0)		

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Syphilis was less prevalent (3.3%) among respondents who did not use condom at their first sexual activity compared with those who used condom during their first sexual encounter ($\chi 2$ (1) = 0.21, p=0.648) though the difference was not statistically significant. Syphilis prevalence was 4.7% among respondents who reported never using a condom and 8.3% among those who always use condoms. It was 2.0% among those who use condoms very rarely. This relation was not significant (χ^2 (4) = 4.34, p=0.362). Patients who did not know where to obtain condoms had a higher prevalence (3.8%), compared with patients who knew where to obtain condoms (3.3%), (χ^2 (2) = 0.42, p=0.812). There was a high prevalence (10.0%) of syphilis among respondents reporting a history of coerced sexual intercourse compared to those without such experience (1.8%). This association was statistically significant (χ^2 (2) = 8.79, p=0.003). A higher prevalence (9.8%) of infection was observed among respondents who said they had more than one sex partner in the past year compared with 1.8% prevalence among respondents who reported having had only one sex partner within the past year. This association was statistically significant (χ^2 (2) = 0.54, p=0.014). Fifty-eight (20.9%) of the respondents reported having casual sex within the past year whiles 219 (79.1%) respondents reported no incidence of casual sex. Though the prevalence was high (5.2%) among those who had casual sex compared with those who had no casual sex (2.7%), the relationship was not significant (χ^2(1) = 0.86, p=0.353). The association between syphilis infection and engagement in sexual activity in exchange for money or gifts was not significant, (χ^2 (1) = 0.02, p=0.888). Twenty-seven (9.8%) of respondents indicated that they ever had sex in exchange for money or for gifts. Out of this number, only one (3.7%) had syphilis compared with 5.3% of those who had never engaged in sex for money or gifts. Of the 277 respondents, 32 (11.6%) indicated they ever received transfused blood, whiles 240 (86.6%) indicated they had

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never received transfused blood. The prevalence of syphilis among these groups were almost similar (3.1% and 3.3%) with no significant association with syphilis infection, ($\chi^2(2) = 0.17$, p=0.916). With regards to history of STIs, 59 (21.3%) of respondents reported ever been diagnosed with STI while 218 (78.7%) had never been diagnosed of any STI. The prevalence was 3.4% among those who had a history of STI compared with 3.2% among those with no history of STI. There was no significant association ($\chi^2(1) = 0.00$, p=0.945). Fifty (20.2%) of the respondents ever took alcohol before sex within the past three month prior to the study compared to 227 (79.8%) of respondents who indicated they did not consume alcohol before sex within the past three months. The prevalence was 3.6% and 3.1% for those who consumed alcohol and those who did not consume alcohol respectively. The association however was not significant (χ^2 (1) = 0.02, p=0.879). Sixty-seven (24.2%) of the respondents ever had syphilis screening and 210 (75.8%) had never been screened for syphilis. The prevalence of syphilis was 3.0% for those who had ever been tested compared to 3.3% among those who had never been tested for the disease. The prevalence was 12.5% among those who had positive screening test results compared with 7.4% among those who had negative screening test results with an insignificant test of association ($\chi^2(2) = 2.89$, p=0.235).

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Table 8a: Association between Sexual behaviour profiles and Syphilis Infection

Characteristic	N (%)	Syphilis test		X^2(df)	p-value
		Positive (%)	Negative (%)		
Condom use at first sexual intercourse				**0.21(1)**	**0.648**
Used condom	66 (26.7)	3 (4.5)	63 (95.5)		
Did not use condom	181 (73.3)	6 (3.3)	175 (96.7)		
Frequency of condom use				**4.34(4)**	**0.362**
Always	12 (4.4)	1 (8.3)	11 (91.7)		
Very often	23 (8.4)	0 (0.0)	23 (100.0)		
Rarely	40 (14.6)	0 (0.0)	40 (100.0)		
Very rarely	51 (18.6)	1 (2.0)	50 (98.0)		
Never used one	149 (54.2)	7 (4.7)	142 (95.3)		
Know where to obtain condom				**0.42(2)**	**0.812**
Had knowledge	213 (79.9)	7 (3.3)	206 (96.7)		
Had no knowledge	53 (19.1)	2 (3.8)	51 (96.2)		
Do not know	11 (4.0)	0 (0.0)	11 (100.0)		
History of coerced sex				**8.79(1)**	**0.003**
Ever had coerced sex	50 (18.1)	5 (10.0)	45 (90.0)		
Never had coerced sex	227 (81.9)	4 (1.8)	223 (98.2)		
Number of sex partners in the past year				**8.54(2)**	**0.014**
None	56 (20.2)	1 (1.8)	55 (98.2)		
One	170 (61.4)	3 (1.8)	167 (98.2)		
More than one	51 (18.4)	5 (9.8)	46 (90.2)		
Casual sex in the past 1 year				**0.86(1)**	**0.353**
Had casual sex	58 (20.9)	3 (5.2)	55 (94.8)		
Did not have casual sex	219 (79.1)	6 (2.7)	213 (97.3)		
Sex in exchange for money or gifts				**0.02(1)**	**0.888**
Had	27 (9.8)	1 (3.7)	26 (96.3)		
Did not have	150 (90.2)	8 (5.3)	142 (94.7)		
History of blood transfusion				**0.17(2)**	**0.916**
Blood transfused	32 (11.6)	1 (3.1)	31 (96.9)		
No blood transfusion	240 (86.6)	8 (3.3)	232 (96.7)		
Do not know	5 (1.8)	0 (0.0)	5 (100.0)		

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Table 7b: Association between Sexual Behaviour profiles and Syphilis Infection

Characteristic	N (%)	Syphilis test		X^2(df)	p-value
		Positive (%)	Negative (%)		
History of STIs				**0.00(1)**	**0.945**
Ever had STI	59 (21.3)	2 (3.4)	57 (96.6)		
No history of STI	218 (78.7)	7 (3.2)	211 (96.8)		
Disclosure of STI status to partner				**0.98(1)**	**0.321**
Disclosed	40 (67.8)	2 (5.0)	38 (95.0)		
Did not disclose	19 (32.2)	0 (0.0)	19 (100.0)		
Alcohol consumption within 3 months				**0.02(1)**	**0.879**
Consumed	50 (20.2)	2 (3.6)	48 (96.4)		
Did not consume	227 (79.8)	7 (3.1)	220 (96.9)		
Ever screened for syphilis				**0.02(1)**	**0.889**
Ever screened	67 (24.2)	2 (3.0)	65 (97.0)		
Never screened	210 (75.8)	7 (3.3)	207 (96.7)		
Screening test results				**2.89(2)**	**0.235**
Positive	8 (11.9)	1 (12.5)	7 (87.5)		
Negative	54 (80.6)	1 (7.4)	53 (92.6)		
Do not know	5 (7.5)	0 (0.0)	5 (100.0)		

4.4.2 Bivariate and Multivariate Analyses of Factors Associated with Syphilis Infection

Bivariate and multivariate analyses were carried out using logistic regression and multiple logistic regression on factors that were statistically significant with syphilis infection in the chi-square test of association. The results of both analyses are presented in Tables 8

The results indicate that the odds of a patient having a positive test results for syphilis infection was 6.31 times more likely in patients from Odoben sub-district compared with patients from Asikuma sub-district (OR = 6.31 [95% CI = 0.64-62.28], p=0.115). However, adjusting for history of coerced sex and number of sex partners within the

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past year, the odds of a patient having a positive test results for syphilis infection was 23.13 times more likely in patients from Odoben sub-district compared with patients from Asikuma sub-district, (aOR =23.13 [95% CI = 1.34-397.96], p=0.030). This association was not statistically significant for the crude odds ratio but statistically significant for the adjusted odds ratio.

The odds of a patient having a positive test results for syphilis infection was 28.06 times more likely in patients from Anhwiam sub-district compared with patients from Asikuma sub-district (OR =28.06 [95% CI = 3.09-255.42], p=0.003), however, after adjusting for history of coerced sex and number of sex partners within the past year, the odds of a patient having test results for syphilis infection was 173.28 times higher in patients from Anhwiam sub-district compared with patients from Asikuma sub-district, (aOR =173.28 [95% CI = 7.45-4028.69], p=0.001). Both odds ratios were statistically significant.

The odds of a patient having a positive test results for syphilis infection was 0.16 times lower in patients who reported no history of coerced sexual intercourse compared ith patients who reported having experienced coerced sex intercourse (OR =0.16 [95% CI = 0.04-0.63], p=0.008). After adjusting for sub-district and number of sex partners within the past year, the odds of a patient having a positive test results for syphilis infection was 0.08 times lower in patients who reported no history of coerced sex compared to patients who reported a history of coerced sex (aOR =0.08 [95% CI = 0.01-0.55], p=0.010). Both odds ratios were statistically significant.

The odds of a patient having a positive test results for syphilis infection was 0.99 times lower in patients who reported having one sex partner in the past year compared with patients who reported having no sex partner (OR =0.99 [95% CI = 0.10-0.9.69], p=0.992). Adjusting for sub-district and history of coerced sex, the odds of a patient

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having a positive test results for syphilis infection was 0.63 times lower in patients who reported having had one sex partner in the past year compared with patients who reported having no sex partner within the past year (aOR =0.63 [95%CI = 0.04-0.9.91], p=0.741). Both odds ratios were not statistically significant.

The odds of a patient having a positive test results for syphilis infection was 5.98 times higher in patients who reported having more than one sex partner in the past year compared with patients who reported having no sex partner (OR =5.98 [95% CI = 0.67-53.02], p=0.108), however, after adjusting for sub-district and history of coerced sex, the odds of a patient having a positive test results for syphilis infection was 26.97 times higher in patients who reported having more than one sex partner in the past year compared with patients who reported having no sex partner in the past year (aOR =26.98 [95% CI = 1.12-647.41], p=0.042). The association was not significant for the crude odds ratio but significant for the adjusted odds ratio.

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Table 9: Crude and Adjusted Odds Ratios of Factors Associated with Syphilis Infection

Characteristic	Crude Odds Ratio (OR)			Adjusted Odds Ratio (aOR)		
	OR	95% CI	p-value	aOR	95% CI	p-value
Subdistrict						
Asikuma	1.00			1.00		
Odoben	6.31	0.64-62.28	0.115	23.13	1.34-397.96	0.030
Anhwiam	28.06	3.09-254.42	0.003	173.28	7.45-4028.69	0.001
History of coerced sex						
Yes	1.00			1.00		
No	0.16	0.04-0.63	0.008	0.08	0.01-0.55	0.010
Number of sex partners in past 1 year						
None	1.00			1.00		
One	0.99	0.10-9.69	0.992	0.63	0.04-9.91	0.741
More than one	5.98	0.67-53.02	0.108	26.97	1.12-647.41	0.042

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CHAPTER FIVE

5.0: DISCUSSION

5.1: Prevalence of Syphilis Infection

The objectives of the study was to determine the prevalence of syphilis and to assess the factors associated with syphilis infection among outpatients aged 15 to 49 years in Asikuma Odoben Brakwa district.

The findings of this study revealed an overall syphilis prevalence of 3.2% in the district with 5.7% prevalence among males and 1.7% among females. The overall prevalence is higher compared to 0.9% overall prevalence reported in a population-based study in Rwanda (Mutagoma et al., 2016), and 2.1% prevalence reported in Mayotte in India (Saindou et al., 2012). It is higher compared to 1.6% prevalence reported among pregnant women seeking antenatal care in selected health facilities in the district by the Ghana AIDs Commission's HIV/AIDs Sentinel Survey (GAC, 2016). It is slightly higher compared to the prevalence of 2.3% and 2.2% in a study in 2007 and 2008 respectively in South African women (Manda et al, 2012), and 1.4% prevalence in a study that assesses the risk factors associated with sexually transmitted infections among women of reproductive age in Swaziland (Ginindza et al., 2017). In a study conducted among prison inmates in Mexico, the prevalence was 0.7% (Belaunzaran-Zamudio et al., 2017) which is low compared with the overall prevalence of this study. The reason for the high prevalence recorded in this study compared with other studies may be due to the differences in study designs. This study was facility-based, not population-based as in most of the studies, and therefore respondents were people seeking care in the health facilities of which syphilis infection could be part of reasons they came seeking care. Therefore, there is high probability of getting people with syphilis than if the study was population-based where respondents are healthy people.

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The overall prevalence of this study (3.2%) is the same to a study that examined the difference in HIV and syphilis prevalence among older males with and without stable sex partners in China where a prevalence of 3.2% was observed (Chen et al., 2017). The overall prevalence however, is lower compared to 8.5% prevalence reported in a similar facility-based study conducted among patients aged 15-49 years in Cape Coast Metropolis (Metropolis, 2015) and 4.2% among women attending antenatal clinic in Congo (Taylor, 2014). The low prevalence (3.2%) of syphilis observed in this study compared with that in Cape Coast (8.5%) may be due to the difference in prevalence of sexually transmitted infections between these two districts, where Cape Coast metropolis had a much higher HIV prevalence than Asikuma Odoben Brakwa district in 2016 (GAC, 2016).

The sex specific prevalence of syphilis was also higher compared with other studies. For example, in a study on HIV and syphilis among Brazilian Amazon indigenes, the prevalence of syphilis was 2.23% and 1.51%, for men and women respectively (Benzaken et al., 2017). Though the prevalence for the males differs from this study, the prevalence for the females was almost similar to that of this study (1.7%). In a facility-based study the prevalence of syphilis in 2010, 2011, and 2012 where overall prevalence were 2.27%, 1.58%, and 2.11%, respectively, males had a higher prevalence than females which was similar to this study, and 7.5% and 4.3% prevalence were also recorded for males and females respectively in a syphilis prevalence study in a Reference Center in Brazil (Gomes et al., 2017).

A high prevalence of syphilis was observed among patients older than 80 years, followed by patients younger than 19 years, while patients aged 20-39 years had the lowest positive prevalence in China (Xu et al, 2016). This supports findings of this study where the highest prevalence was also observed among age 44-49 years

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indicating higher prevalence in older people compared to younger people. This may be due to the fact that they may be having some of the younger people as sex partners.

5.2: Knowledge on Syphilis Infection

The results of the study indicated that majority of respondents 244 (88.1%) have ever heard of syphilis. This is far higher than the findings of a previous study where only 32.9% of the respondents indicated they ever heard of the disease (Rahman, Kabir & Shahidullah, 2009). This high number of respondents might have heard about the disease during the series of rigorous educational campaigns that were embarked on in the district when the HIV sentinel survey findings put the district in first position as having the highest syphilis prevalence in the country in 2008 (GAC, 2008). The 33 (11.9%) respondents who indicated they never heard of syphilis may be attributed to the fact that they lived in rural areas within the district or come from outside the district and hence had no access to health education regarding syphilis. Also, though 60.7% knew that syphilis affects everybody, the rest, 2.9%, and 30.7% who indicated that it affects only children and only adults respectively, were not entirely right. They may take no precautionary measures to protect themselves from contracting the disease by perceiving themselves to be adults which the disease cannot affect. This perception might have accounted for the high prevalence of syphilis infection (14.3%) among those who indicated that syphilis affects only children. Fourteen (5.7%) respondents who had no idea about people syphilis affects may not be able to make any guided decisions regarding syphilis prevention.

The low prevalence of 2.2% in respondents who knew genital ulcer as a manifestation of syphilis, compared to 3.9% prevalence in those who did not know any manifestation of syphilis is an indication that syphilis infection declines as knowledge regarding how the disease manifests in individuals improves. Majority of patients knew about how

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syphilis is transmitted from one person to another, however, quite a significant number did not know about any mode of transmission.

According to 67.2% of respondents, syphilis can be transferred from a pregnant mother to her foetus in the womb which is true as indicated in the CDC guideline for sexually transmitted infections (Centers for Disease Control and Prevention, 2016). Majority of the respondents (96.3%) also indicated that syphilis can be prevented.

Even though majority of the respondents had ever heard of the disease which is good, their knowledge regarding how the disease is transmitted, the category of people that the disease affects, how the disease manifest and mother-to-child transmission of the disease could not be concretely validated. Their responses might just be informed by mere linking of knowledge acquired through education campaigns from other sexually transmitted diseases, especially HIV/AIDS which most people are familiar with.

5.3: Factors Associated with Syphilis Infection

The study also assess the factors that account for syphilis infection. The study revealed that the risk of acquiring syphilis infection increases with age, with 44-49 age group having the highest prevalence which agreed with other studies in Africa. For example, in Tanzania, 35-40 and 41-49 years age groups experienced the highest syphilis prevalence (Swai et al. 2006) and in China, the prevalence was highest in people who were 80 years and above (Xu et al, 2016). This could be explained by the fact that some of the older people have the young ones as their sex partners.

Though statistically insignificant, males had a high prevalence (5.7%) compared to females (1.7%) in this study which does not support findings of other studies that recorded 0.8% prevalence in males and 1.0% in females. The prevalence is also high among Muslims (5.3%) compared to Christians (3.2%) and traditionalists. This conforms with findings of a study in Rwanda (Mutagoma et al., 2016) and 1.5% in

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males compared to 2.0% in females (Escobar, Coates & Caceres, 2010). The reason could be explained by the fact that Muslims are permitted by their religion (Islam) to marry more than one wife (maximum of 4 wives) resulting in an increase in the number of concurrent sex partners. This may promote the spread of syphilis than their Christian counterparts who are permitted to marry only one wife.

The sub-district of residence of respondents was one of the statistically significant predictor for syphilis infection in this study ($X^2(4) = 31.20$, $p<0.0001$). Patients who reside in Anhwiam sub-district were 173.28 times more likely to have positive test results for syphilis infection compared to patients from Asikuma sub-district. This is consistent with some studies in Ghana and Africa. For example, the HIV sentinel survey in Ghana reported a high prevalence in the rural sites compared to urban sites (GAC, 2015). In Zambia, syphilis surveillance report identified the highest prevalence of 16.0% among roadside residents followed by rural dwellers (10.5%), and 5.8% for urban citizens (Swai et al, 2006). The reason for the high prevalence of syphilis in Anhwiam sub-district could be attributed to the fact that communities in that sub-district are very remote and experiencing multiple deprivation coupled with lack of access to proper healthcare services and preventive commodities such as condoms and health educational material regarding sexually transmitted infections, including syphilis. This is justified by the fact that the sub-district had only two (2) Community-Based Health Planning and Services (CHPS) facilities that provide basic primary health care service. The findings of this study is however, not consistent with a study that put Kumasi residents (urban) 1.16 times more likely to contracting syphilis infection compared to those living outside the Kumasi metropolis (rural) (Sarkodie et al., 2016).

Educational status was not a significant predictor of syphilis infection in this study as opposed to the population based study in Rwanda (Mutagoma et al., 2016), where those

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who attained secondary/vocational/high education are 0.4 times less likely of obtaining a positive test result for syphilis compared to those with no education/primary education. This variation could be due to the fact that those who had higher education in the rural areas may be financially sound and may attract a lot of more sex partners to themselves compared to those who are poor and less educated. They may also have the means to marry more wives if they happen to be Muslims.

A significant association was also seen between history of coerced sex and syphilis infection. The prevalence among patients reporting a history of coerced sexual intercourse was 10.0% compared to 1.8% in those who never experienced coerced sex ($X^2(2) = 8.79$, p=0.003). Patients who reported no history of coerced sex were 0.08 times less likely to have a positive test for syphilis compared to patients who reported a history of coerced sex. This conformed with the results of a study in California which observed that girls with a history of coerced sex were 1.39 times more likely to have a STI than those who do not (Upchurch & Kusunoki, 2004). Coerced sex was identified to have strong effects on inconsistent condom use: women who reported that their most recent partner forced them to have sex were 5.77 times more likely to be inconsistent condom users with that partner (Pettifor et al, 2004). Women who experienced coerced sex may be unwilling and end up having multiple sex partners and may sustain physical genital trauma during intercourse that may facilitate the transmission of syphilis and other sexually transmitted infections.

A statistically significant association was also seen between number of sex partners and syphilis infection ($X^2(2) = 8.54$, p=0.014). Even though the prevalence observed was 1.8% in both respondents who never had a sex partner and those who had only one sex partner within the past 1 year, the prevalence was higher (9.8%) in those who reported they had more than one sex partner within the past year prior to this study. In the

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multivariate analysis, where all significant factors in the study were put into the logistic regression model, revealed that patients who had more than one sex partner within the past year had 26.97 times the odds of having a positive test result for syphilis compared with those who never had a sex partner within the past year. This is consistent with the findings of a study in China where those who had more than one sex partner in the past year were 4.13 times more likely to have a positive test result for syphilis compared to those who never had (Benzaken et al., 2017), and 1.2 times more likely for those who had more than one sex partner compared to those who never had a sex partner in Russia (Rhodes et al., 2006).

The prevalence of syphilis in respondents who reported having had casual sex in the past year was 5.2% compared to 3.7% among those who did not have which is not statistically significant predictor of syphilis infection in this study. However, it was significant in a study in which pregnant women who had casual partners were 2.0 time more likely of having a positive test result for hepatitis B surface antigen (Saindou et al., 2012). This could be due to the fact that majority of respondents who had positive test results for syphilis in this study come from rural communities where people tend to know almost everybody in the community as opposed to urban areas.

Regarding respondents engaging in sex in exchange for money or gifts, strangely high prevalence (5.3%) was recorded among those who did not engage in sex for money or gifts compared to 3.7% in those who engaged in such practices. Also, the prevalence was slightly higher in those who indicated that they did not received transfused blood (3.3%) compared to 3.1% among those who indicated they ever received transfuse blood. This is an indication that the transmission of the disease in the district may be through other means other than unsafe blood transfusion.

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Other studies found an association between self-reported history of STIs and syphilis infection. For example, it was reported in Mayotte in India that those who reported ever had an STI were 13.27 times more likely of having a positive test for syphilis compared to those who reported no history of STIs (Saindou et al., 2012). This study however found no significant association even though high prevalence (3.4%) was seen in patients reporting history of STI compared to those reporting no history of STI (3.2%).

The difference in prevalence could be attributed to the fact that the mode of transmission for most of the STIs are similar and thus a previous STI might have promoted the contraction of syphilis as indicated in a study which revealed an increased odds of contracting syphilis by 4.2 folds in individuals who self-reported having had HIV infection (Mutagoma et al., 2016).

According to Freeman & Justice, (2009), drinking alcohol once or more times a week increases the odds of syphilis by 1.9 times compared to those who do not consume alcohol. In this study, though statistically insignificant, the prevalence of syphilis is high (3.6%) in those who reported to have ever consumed alcohol compared with 3.1% in those who reported to have never consumed alcohol. Alcohol consumption may promote indiscriminate casual sex, coerced sex and decrease the likelihood of condom use for protection.

Majority of the respondents (75.8%) had never been screened for syphilis. The prevalence of the disease among them was 3.3% compared to 3.0% in those who had been screened. Those who had positive results during the screening process had the highest prevalence (12.5%) compared to 7.4% in those who had negative test results. The high percentage recorded for the never screened reflected the lack of screening programmes for syphilis and other diseases in the district. The only exception in this

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regard is HIV/AIDS where voluntary counselling and testing service are available in the health facilities. Even with that, several challenges such as inadequate and irregular supply of test kits, inappropriate counselling practices and bad staff attitudes impede its successful implementation.

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CHAPTER SIX

6.0: CONCLUSION AND RECOMMENDATIONS

6.1: Conclusion

From the findings, the overall prevalence of syphilis among outpatients is 3.2%. The prevalence is high in males (5.7%) than in females (1.7%). Patients within the 40-49 years age group have the highest prevalence.

Patients living in Anhwiam sub-district are more likely to have a positive test result for syphilis infection than patients living in Asikuma sub-district.

Having coerced sexual intercourse promotes the transmission of syphilis infection. Patients who are forced into having sex are more likely to have a positive test results for syphilis infection than patients who willingly engage in sex.

Having more than one sex partner increases an individual's chance of contracting syphilis infection.

6.2: Recommendations

Based on the conclusions of this study, the following are recommended.

1. The District Health Management Team and the Sub-district Health Management Teams should initiate syphilis control strategies that focus more on the male population.
2. The District Health Management Team should increase access to syphilis control interventions in rural areas especially Anhwiam sub-district.
3. The District Health Management Team should collaborate with community leaders to institute community-based programmes that discourage coerced sexual activities.
4. The District Health Management Team should intensify health education on syphilis prevention with more emphasis on condom use.

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APPENDICES

Appendix 1: Informed Consent Form

Introduction

My name is Martin Banong-le and I am a graduate student from the School of Public health, University of Ghana, Legon, Accra. I am undertaking a research study on the topic **"Factors Associated with Syphilis infection among Outpatients in Asikuma Odoben Brakwa district"**

The purpose of the study is to determine the prevalence and patient factors associated with syphilis infection among outpatients aged 15-49 years in the district.

This informed consent is to ensure that you understand the purpose and your responsibilities in the research before you decide if you want to be part or not.

Study procedure

This is a research study that would involve taking of blood sample to test for syphilis and answering questions to an interviewer using a questionnaire. The interview would involve you answering questions about factors associated with syphilis infection. The whole study would last for about one month but your participation will be only for today and will take about 45 minutes after you seen the clinician.

Voluntary participation

You have the right not to participate in the study or to withdraw from the study at any time without any consequences to you. Should you choose to withdraw, the information you provide would not be used in the study. You are entitled to ask questions at any point in the study for clarification. Any aspect of the questions that is not well understood will be clarified by the interviewer.

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Risk and benefit

Since blood samples will be collected to test for syphilis it may cause a bit of pain, bleeding and risk of infection, however, measure are in place to prevent these. Pressure will be applied to the site where blood will be drawn and sterile needle and alcohol swab will be used. Benefits of this study will be improvement in the control and management of syphilis infection in the district.

Compensation

No payment will be made for your time; however, you will be treated free of charge by Asikuma Odoben Brakwa District Health Directorate if you test positive for syphilis.

Confidentiality

We will protect all information you give us in this research to the best of our ability. We will not discuss your participation with anyone outside the research team. All responses will be treated as confidential as no names will be placed on the questionnaires.

This research has been reviewed and approved by Ghana Health Service Ethical Review Board. If you have any questions about this study, you may contact:

Martin Banong-le (Principal Investigator): 0205939225 or 0243836048

E-mail:banonglemartin@gmail.com

Hannah Frimpong (GHS-ERC Administrator): Mobile: 0243235225 or 0507041223

Email:Hannah.Frimpong@ghsmail.org

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Participant's Consent Form

I have read through the foregoing information/the foregoing information has been read and interpreted to me and I fully understand all that has been explained to me about the objectives, benefits, risks and my rights to withdraw from the study at any time without any consequences to me. I have been given opportunity to ask questions and have been answered satisfactorily. I therefore agree to participate in this study.

Please confirm your participation by signing below.

Signature/Thumbprint of participant Date

....

P.I/Research Assistants name.....

Signature ..... Date.....

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Appendix 2: Laboratory Test Results Form

No	Patient code	Name of Patient	First Response Syphilis Anti-TP Test Result	TP-PA confirmatory test Result	Patient contact number
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

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Appendix 3: Sample Structured Questionnaire
Factors Associated with Syphilis Infection Among Outpatients in Asikuma Odoben Brakwa District.

No.	Question	Code	Option	Remarks
1.	**Respondent's ID**			
Demographic Data				
2.	Age		.....yrs.	
3.	Sex	1	Male	
		2	Female	
4.	Marital status	1	Single	
		2	Married	
		3	Separated/Divorced	
5.	Occupation	1	Farming	
		2	Trading	
		3	Artisan	
		4	Public servant	
		5	Students	
		6	Other.....	
6.	Religion	1	Christian	
		2	Muslim	
		3	Traditionalist	
		4	Other.....	
7.	Educational level	1	No formal education	
		2	Basic	
		3	Secondary	
		4	Tertiary	
8.	Residence type	1	Rural	
		2	Urban	
9.	Subdistrict	1	Asikuma	
		2	Odoben	
		3	Brakwa	
		4	Anhwiam	
		5	Outside district	

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No.	Question	Code	Option	Remarks
Knowledge about syphilis				
10.	Have you heard about the disease called syphilis?	1	Yes	
		2	No	⇒ *go to no.16*
11.	What category of people does syphilis affect?	1	Everybody	
		2	Only children	
		3	Only adults	
		4	Don't know	
12.	What are the signs/symptoms of syphilis?	1	Genital ulcer	
		2	Skin lesions	
		3	Fever	
		4	Rash	
		5	Don't know	
13.	How does someone get infected with syphilis?	1	Sexual intercourse	
		2	Kissing	
		3	Blood transfusion	
		4	Don't know	
		5	Other.....	
14.	Can an infected pregnant mother transmit syphilis to her unborn baby?	1	Yes	
		2	No	
		3	Don't know	
15.	Can syphilis be prevented?	1	Yes	
		2	No	
		3	Don't know	
Factors associated with syphilis infection				
16.	At what age did you have your first sexual encounter?		.....yrs.	
17.	Did you use a condom during your first sexual encounter?	1	Yes	
		2	No	

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No.	Question	Code	Option	Remarks
18.	How often do you use a condom?	1	Always (all the time)	
		2	Very often (once a week)	
		3	Rarely (once a month)	
		4	Very rarely (once in over a month)	
		5	Not at all (never use one)	
19.	In case you decide to use a condom do you know where to obtain one?	1	Yes	
		2	No ⇒	*go to No.21*
		3	Don't know ⇒	*go to No.21*
20.	If yes, where will you get one?	1	Health facility	
		2	Chemical sellers	
		3	Other.....	
21.	Have you ever been forced into having sex?	1	Yes	
		2	No ⇒	*go to No.23*
22.	If yes, was he/she someone you knew before?	1	Yes	
		2	No	
23.	How many sex partners have you had in your lifetime?	1	None	
		2	Only one	
		3	More than one	
24.	How many active sex partners have you had within the past 12 months?	1	None	
		2	Only one	
		3	More than one	
25.	Have you had any casual sex in the past 12 months?	1	Yes	
		2	No	
26.	Have you had sex in the past 12 months in exchange for money or gifts?	1	Yes	
		2	No	

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No.	Question	Code	Option	Remarks
27.	Have you ever received transfused blood?	1	Yes	
		2	No	
		3	Don't know	
28.	Have you had any disease in the past that you perceived to be a sexually transmitted infection?	1	Yes	
		2	No	⇨ *go to no.30*
29.	If yes, did you disclose it to your sex partner(s)?	1	Yes	
		2	No	
30.	Have you or your partner took alcohol before sex in within the past three month?	1	Yes	
		2	No	
31.	Have you ever undertook syphilis screening?	1	Yes	
		2	No	⇨ *End interview*
32.	If yes, what was the test result?	1	Positive	
		2	Negative	
33.	If positive, did you receive further lab investigation and treatment?	1	Yes	
		2	No	
34.	If yes, where did you receive treatment?	1	Health facility	
		2	Chemical seller	
		3	Herbalist	
		4	Other.....	

Thank you.

End of Interview

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No.	Question	Code	Option	Remarks
27.	Have you ever received transfused blood?	1	Yes	
		2	No	
		3	Don't know	
28.	Have you had any disease in the past that you perceived to be a sexually transmitted infection?	1	Yes	
		2	No	⇨ *go to no.30*
29.	If yes, did you disclose it to your sex partner(s)?	1	Yes	
		2	No	
30.	Have you or your partner took alcohol before sex in within the past three month?	1	Yes	
		2	No	
31.	Have you ever undertook syphilis screening?	1	Yes	
		2	No	⇨ *End interview*
32.	If yes, what was the test result?	1	Positive	
		2	Negative	
33.	If positive, did you receive further lab investigation and treatment?	1	Yes	
		2	No	
34.	If yes, where did you receive treatment?	1	Health facility	
		2	Chemical seller	
		3	Herbalist	
		4	Other.....	

Thank you.

End of Interview