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HIV in Sunyani and peri-urban areas is associated with previous history of syphilis infection and multiple sexual partners: A cross-sectional study

Kingsley ARHIN-WIREDU [1], Raymond Boadu ANNOR [1], Frank ADUSEI-MENSAH [2], Bismark SARFO [1*]

[1] Department of Epidemiology and Disease Control, School of Public Health, University of Ghana, Legon, Ghana;
[2]Institute of Public Health and Clinical Nutrition, University of Eastern Finland, Kuopio, Finland

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Abstract

Background: The Bono Region of Ghana has consistently recorded high HIV prevalence over the years, with an average prevalence of 3.4% in the recent HIV survey. Sunyani, the capital region of Bono, recorded an HIV prevalence of 3.8% higher than the HIV Sentinel Survey average.

Objective: This study assessed the factors associated with the high HIV prevalence in the Sunyani municipality of the Bono Region of Ghana.

Methods: Participants accessing HIV counselling and testing services were enrolled from three hospitals in the Sunyani Municipality using a cross-sectional design from March to August 2018 and were interviewed using a structured questionnaire. Descriptive and logistic regression analyses were used to identify factors associated with HIV prevalence at $p < 0.05$ with a 95% confidence interval.

Results: The mean age of respondents was 30.8 ± 8.5 years. The prevalence of HIV among participants was 10.3% (95% CI: 7.82 - 13.54). HIV prevalence per sub-districts ranged from 0 to 11.9%, with New Dormaa recording the highest at 11.9% (CI: 5.7 - 23.1). Almost 28% (n = 13/46) of the HIV-positive participants reside in districts outside the Sunyani Municipality. Participants with a previous history of syphilis were six times more likely to be HIV positive compared with those with vaginal or urethral discharges (aOR = 6.39, 95% CI: 4.14 - 9.78), and those with multiple sex partners have three times increased odds of contracting HIV compared with a single partner (aOR = 3.33, 95% CI: 1.16 - 9.55).

Conclusion: The prevalence of HIV in Sunyani municipality was significantly associated with multiple partners and a previous history of syphilis infection.

Keywords: HIV, AIDS, syphilis, Ghana

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INTRODUCTION

According to the World Health Organization, approximately 60% of people living with HIV (PLWH) in the world reside in Sub-Saharan Africa [1]. Though HIV morbidity and mortality have declined in the world by 49% and 61%, respectively, sub-Saharan Africa continues to be the most affected region in the world [1]. The median HIV prevalence for 2019 in Ghana was 2.0%, an increase from the 2015 prevalence of 1.8% and 2014 prevalence of 1.6% [2], a situation which indicates an increase in HIV prevalence in the country over the past five years. HIV prevalence at regional levels ranged from 0.8% in the North East region of Ghana to 3.4% in the Bono region [2]. Sunyani has a fluctuating HIV prevalence, which almost stabilised at 2.0% in 2012 and 2013. However, HIV prevalence in Sunyani steadily increased to 5% in 2014, which is double the Bono regional prevalence of 2.6% [3]. Before 2016, there had been a steady decrease to 3.8% in 2015 and 2019. However, the prevalence in Sunyani was double the then Brong Ahafo regional

* *Corresponding author*
Email: bsarfo@ug.edu.gh

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prevalence of 1.7% [3]. According to the Ghana National HIV Sentinel Site Survey report, 2016 and 2019, Sunyani was one of the thirteen (13) sites that did not change in prevalence over the previous years [3].

Despite all the interventions put in place by the Ghana National AIDS/STI Control Programme to reduce the prevalence of HIV in Ghana, HIV continues to be a Public Health threat affecting many Ghanaians, with females primarily infected [4]. Large proportions of new HIV cases are recorded every year, and these are not evenly distributed per geographic location. Though HIV prevalence decreased from 4.2% in 2016 to 3% in 2017, Sunyani tends to record HIV prevalence (3.8%) above the Bono Region regional prevalence of 3.4 % and the HIV Sentinel Survey average of 2.0% [2]. Several studies have revealed that unprotected sex, contracting another sexually transmitted infection (STI), sharing contaminated needles and syringes, accidental needle stick injuries, breast milk, the unfavourable economic position of women, rate of rape, inconsistent condom use and alcohol consumption are known factors associated with HIV transmission [5,6,7,8]. The National AIDS/STI Control Programme has an overall goal of reducing the impact and effect of HIV with interventions such as “know your HIV status”, free “Prevention of Mother-to-Child Transmission”, “condom promotion and distribution”, “blood safety”, “HIV Exposure Prevention in the Health care and other settings”. In the face of all these interventions by the National AIDS/STI Control Program, the prevalence of HIV in the Sunyani Municipality over the past years has been consistently above the Bono Regional prevalence. Barring any move by the regional and district Health Directorate to identify and determine the underlying cause of the increase since 2017, this could lead to a further increase in HIV prevalence in the Sunyani municipality. Identifying the factors that drive this unusually high prevalence of HIV will help in designing targeted interventions for implementation in the Sunyani municipality. This study identified factors contributing to the fluctuating trend in HIV prevalence over the past years in the Sunyani Municipality and its surrounding towns.

MATERIALS AND METHODS

Study design and sites

Sunyani is the capital of the Bono Region of Ghana. There are 31 health facilities and 34 community-based health planning services (CHPS) Zones in the Sunyani Municipality, consisting of 18 prevention of mother to child transmission (PMTCT) sites. Four out of the 31 municipal health facilities provide voluntary HIV testing and counselling services, including regional and municipal hospitals. The study was conducted in three health facilities, namely the Regional Hospital, the Municipal Hospital and the Seventh Day Adventist (SDA) Hospital, which were identified as having recorded the highest number of HIV-positive cases in the Sunyani Municipality. A facility-based cross-sectional study was conducted among participants accessing HIV testing and counselling services in the Sunyani Municipality of Ghana in 2018. Data on patients’ demographic characteristics, knowledge of HIV, transmission risk factors and HIV prevention were collected and analysed to determine factors associated with HIV prevalence in the area.

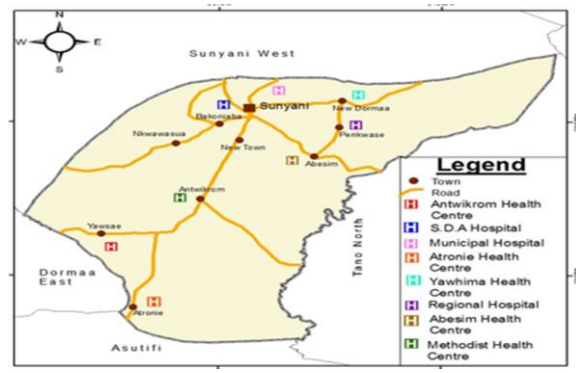

Figure 1. Map of Sunyani and surrounding areas (adopted from Williams Kumi, Research Gates.net)

Table 1. Sample selection from facilities

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

Study participants

Participants who were 19 years and above accessing HIV testing and counselling services at the three facilities were included in the study. They were proportionally and randomly sampled from each of the facilities depending on the total number of participants who tested for HIV at each of the facilities.

Sampling method and sample size determination

Using the Cochrane formula of sample size estimation, a total sample size of 445 was determined for the study. The minimum sample size was determined using an estimated HIV prevalence of 4.2% [3], a desired level of precision of +/- 5% and a confidence interval of 95%. Three hospitals in the municipality were selected for the study. The hospitals with the highest number of HIV tests for 2017 were selected. The three health facilities offering HIV counselling and testing services in the municipality were included in determining the proportion of HIV tests done in 2017. Samples were then proportionately allocated to the hospitals based on their estimated annual data on the number of HIV tests conducted. All clients accessing HIV testing and counselling services in the three hospitals were

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selected and consented to the study until the required sample size was met.

Data collection instrument

An interviewer-assisted structured questionnaire was used to collect the data. Face-to-face interviews were conducted with participants accessing HIV counselling and testing services in the three selected hospitals. The data collection tool captured the participants' socio-demographic characteristics, including age, sex, educational level, occupational status, marital status, and religion. Also, data on HIV risk factors were captured to include the previous history of sexually transmitted infections (STI), type of STI previously contracted, the previous history of TB, the number of sexual partners, alcohol use, smoking status, and condom use.

Statistical Analysis

Data were entered into Microsoft Excel (state the version year) and imported into Stata Statistical Software: Release 15. *StataCorp LLC,2017* for cleaning and analysis. Descriptive statistics were done by running frequencies and proportions. Continuous variables such as age were summarised into mean. Age was then categorised into four years intervals according to the Ghana HIV Sentinel Site Report [3]. Pearson chi-square test was done to determine the significant difference between HIV prevalence and the categorical variable, and it was presented as a contingency table with p values. Fisher's exact test was done for variables with frequencies less than 5. A simple logistic analysis was conducted, and variables with a p-value < 0.05 were considered to be statistically significant. Significant variables and variables which the literature has determined are associated with HIV infection were modelled in a multiple logistics regression to determine factors that are statistically significantly associated with HIV infection. The results were presented in a two by two table to display frequencies, percentages, crude and adjusted odds ratios at 95% confidence interval and p values. Statistical significance was set at $p < 0.05$.

The team obtained ethical clearance and approval from the Ghana Health Service Ethics Review Committee (GHS-ERC: 082/12/18). Permissions were obtained from the three health facilities before the commencement of the study. Participants' confidentiality and privacy were safeguarded during questionnaire administration. Each respondent was assigned a code that could be traced to the registration number in the HIV counselling and testing register.

RESULTS

Table 2 shows the background characteristics of the respondents who participated in the study. The ages of participants ranged from 19 - 66 years, with a mean age of 30.8 years (SD ± 8.5 years). The mean age for males was 30.3 years (SD ± 7.9 years), while that of females was 34.2 (SD ± 10.8 years). Most participants (89.7%, n = 381/445) were Christians compared to Muslims (13, n = 64/445). Out of the 445 participants who participated in the study, 10.3% (n = 46) tested positive for HIV (Table 2). HIV Prevalence per sub municipal in Sunyani Municipality. Table 3 shows the proportion of HIV-positive participants per the number

Table 2. Background characteristics of study participants

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

Table 3. Proportion of HIV reactive clients per sub district in Sunyani

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

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of residents in their sub-districts. Out of the 46 who tested positive for HIV, the majority of them (13) live outside Sunyani Municipal. Among the subgroup living outside Sunyani, the HIV prevalence recorded was 23.2% (95% CI: 13.9 - 36.2). Table 4 is a univariate and multivariate logistic regression analysis testing the association between factors associated with HIV prevalence. In this table, participants' age, education level, history of STI, type of STI previously

Table 4. Logistic Regression Analysis of Factors Influencing HIV Prevalence in Sunyani

				Unadjusted			Adjusted		
Variable	N	Reactive n (%)	Non-Reactive n (%)	OR	95% CI	P value	OR	95% CI	P value
Age group						<0.001*			0.012*
<=19 (Ref)	15	1 (6.7)	14 (93.3)	1.00			1.00		
20-24	65	3 (4.6)	62 (95.4)	0.68	0.06-7.01	0.744	0.08	0.002-2.59	0.154
25-29	143	10 (6.9)	133(93.1)	1.05	0.13-8.84	0.962	0.38	0.02-9.19	0.551
30-34	117	13 (11.1)	104 (88.9)	1.75	0.21-14.2	0.603	0.23	0.009-5.89	0.377
35-39	56	5 (8.9)	51 (91.1)	1.37	0.15-12.7	0.148	0.22	0.007-7.29	0.397
40-44	17	4 (23.5)	13 (76.5)	4.31	0.42-43.7	0.217	0.81	0.01-63.98	0.927
45 and above	32	10 (31.3)	22 (68.8)	6.36	0.73-10.29	0.093	0.65	0.01-33.34	0.829
Sex[c]						0.508			0.723
Female (Ref)	382	38 (9.9)	344 (90.1)	1.00			1.00		
Male	63	8 (12.7)	55 (87.3)	1.32	0.58-2.97	0.508	2.38	0.25-22.59	0.449
Educational level[c]						<0.001*			0.922
No Education (Ref)	30	7 (23.3)	23 (76.7)	1.00			1.00		
Primary	24	4 (16.7)	20 (83.3)	0.66	0.17-2.58	0.547	1.46	0.1-20.89	0.78
JSS	112	14 (12.5)	98 (87.5)	0.47	0.17-1.29	0.144	0.16	0.01-1.79	0.137
MSLC	15	4 (26.7)	11 (73.3)	1.19	0.29-4.96	0.806	2.46	0.06-103.02	0.636
SEC/TECH	84	12 (14.3)	72 (85.7)	0.55	0.19-1.56	0.258	3.22	0.296-34.99	0.337
Tertiary	180	5 (2.8)	175 (97.2)	0.09	0.03-0.32	<0.001*	0.27	0.016-4.52	0.359
STI						0.004*			<0.001*
Never had STI	155	25 (16.1)	130 (83.9)	1.00			1.00		
Ever had STI	290	21 (7.2)	269 (92.8)	2.46	1.33-4.56	0.004*	0.00	0.0001-0.048	<0.001*
STI type						<0.001*			0.123
Vaginal discharges (Ref)	117	17 (14.5)	100 (85.5)	1.00			1.00		
Syphilis	29	16 (55.2)	13 (44.8)	7.23	2.96-17.71	<0.001*	6.39	4.14-9.78	0.035*
Gonorrhea	31	13 (41.9)	18 (58.1)	4.24	1.76-10.24	0.001*	1.58	0.21-2.09	0.661
TB						0.036*			0.262
Never had TB(Ref)	20	5 (25)	15 (75)	1.00			1.00		
Ever had TB	425	41 (9.7)	384 (90.4)	3.12	1.07-9.03	0.036*	3.39	0.27-42.01	0.342
Sexual activeness						0.028*			0.666
Never had Sex (Ref)	33	7 (21.2)	26 (78.8)	1.00			1.00		
Active in the past month	346	22 (6.4)	324 (93.6)	0.25	0.09-0.65	0.004*	0.22	0.04-0.108	0.108
Not active past 1month	66	17 (25.8)	49 (74.2)	1.29	0.47-3.5	0.619	0.83	0.09-7.18	0.868
Number of partners						0.025			0.025*
One (Ref)	364	28 (7.7)	336 (92.3)	1			1.00		
Two or more	81	18 (22.2)	63 (77.8)	3.43	1.79-6.57	<0.001*	3.33	1.16-9.55	0.025*
HIV Testing						0.001*			0.03*
Never tested	377	31 98.2)	346 (91.7)	1.00			1.00		
Ever tested	68	15 (22.1)	53 (77.9)	0.32	0.16-0.63	0.001*	0.33	0.08-1.35	0.124
Referral						0.001*			0.581
Diagnostic HIV(Ref)	71	12 (16.9)	59 (83.1)	1.00			1.00		
Walk in VCT	128	20 (15.6)	103(84.4)	0.91	0.42-1.99	0.814	2.12	0.38-3.98	0.395
PMTCT	246	14 (5.7)	232 (94.3)	0.29	0.13-0.68	0.004*	3.60	0.67-19.65	0.139

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

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contracted, history of tuberculosis, sexual activeness, number of sexual partners, history of testing for HIV, and participants' referral for HIV testing were found to be associated with HIV at the univariate analysis ($p < 0.05$). In the multivariate analysis, participants' age, history of STI, number of sexual partners, and history of testing for HIV remained statistically significantly associated with HIV. Participants who had a past history of STI were about three times more likely to be infected with HIV as compared to those who had no previous history of STI (cOR 2.46 95% CI: 1.33 - 4.56).

Participants who had a past history of syphilis had seven times higher odds of being infected with HIV as compared to those with a previous history of vaginal/urethral discharges (cOR: 7.23, 95% CI: 2.96 - 17.71). These factors remained significantly associated in the multivariate analysis (aOR: 6.39, 95% CI: 4.14 - 9.78). Similarly, participants with a previous history of gonorrhoea were more likely to be infected with HIV (cOR: 4.24, 95% CI: 1.76 - 10.24). HIV infection were associated with multiple sexual partners. Participants with two or more partners were about three times more likely to be infected with HIV infection compared to those with only one partner (cOR: 3.43, 95% CI: 1.79 - 6.57). This association remained independently significant (aOR: 3.33, 95% CI: 1.16 - 9.55) in the multivariate analysis when age, sex, educational level, previous history of STI, type of STI, previous history of tuberculosis, sexual activeness, and HIV testing were adjusted.

DISCUSSION

This study demonstrated an HIV prevalence of 10.3% in the Sunyani municipality in 2018 and that previous history of syphilis infection and multiple sexual partners were significantly associated with HIV infection. HIV prevalence of 10.3% in the Sunyani Municipality in 2018 was high compared with the National HIV Sentinel Survey reported a prevalence of 4.2% [3]. The 2019 HIV Sentinel survey reported an HIV prevalence of 3.4% in the Bono region, which is the highest prevalence among all the 16 regions in the country [2]. There was a higher proportion of HIV-positive participants aged between 25 - 34 years and also among those above 45 years old in this study, and this is consistent with previous WHO findings, which indicate that HIV is common among younger adults [8]. The recent HIV report also put the highest proportion between the 40 - 44 age group, although the 25 - 34 age group is still high [2]. The findings from this study are a useful report in the fight against HIV in terms of targeting prevention messages in light of the UNAIDS 95 – 95 - 95 target goal of significantly reducing HIV incidence by 2030 [1]. There was evidence in this study that the majority of the participants who tested positive were sexually active in the previous month prior to the commencement of the study. Several reports indicated that sexually active men and women have a higher prevalence of HIV compared to sexually inactive people [9,10,11]. This study has demonstrated that a previous history of sexually transmitted infections (STI) was significantly associated with HIV transmission. This finding corroborates several reports which associated STI with HIV infection [12,13]. Vaginal microbes, independently and synergistically [12], enhance HIV RNA shedding into genital secretions [13] and increase HIV susceptibility by 4.5 fold [14]. For instance, in Brazil, a study with participants with a previous history of sexually transmitted infections such as syphilis and gonorrhoea had a higher risk of being infected with HIV [15]. Thus, sexually transmitted infections such as gonorrhoea, chlamydia, syphilis, and others could facilitate HIV transmission by breaking the lining of the genital tract, causing ulcers, and making it easier for the HIV in the genital secretions to slip through during sexual intercourse. In this study, syphilis infection, compared with gonorrhoea and vaginal discharges, was found to be significantly associated with HIV infection in the adjusted regression model. Therefore confirming earlier reports of syphilis and HIV transmission overlap [16].

HIV prevention strategies by HIV advocacy groups and the National HIV/AIDS Control Programmes must continue to include STI prevention strategies through messages targeting less risky sexual behaviours and regular and proper condom use during sexual intercourse in the Sunyani municipality. Similarly, several studies have indicated that having unprotected sex and inconsistent condom use are known factors associated with STIs and HIV infections [5,6,7]. These messages must be consistent as we target the UNAIDS 95 – 95 - 95 goals. Having multiple sexual partners was significantly associated with HIV infection among the participants in this study. This supports previous studies which indicated that multiple sexual partners and a history of genital ulcers among men in the past 12 months were associated with HIV infection [17,18,19]. Having multiple sexual partners is a contributory factor to having a sexually transmitted infection because, with multiple partners, the probability of meeting a partner with an STI infection increases. Generally, people who indulge in risky sexual behaviour, such as having multiple sex partners, do not use protective condoms [19]. Having an STI increases the chance of getting infected with HIV since a previous history of STI indicates that unprotected sex has occurred. STIs are associated with inflammations, histiocytes and lymphocytes, and HIV RNA shedding into genital secretions as well as fluids of sex canals [18].

The authors of this study, therefore, recommend that HIV control strategies, such as repeat testing for HIV and STI, should be reinforced, especially among those who have multiple partners within the Sunyani Municipality. Although in Ghana, every pregnant woman is tested at antenatal registration and at 34 weeks of pregnancy to screen for HIV during pregnancy, several Know Your HIV Status (KYS) campaigns need to be organised in the Sunyani Municipality. Limitations in this study were possibly participants' recall bias and perception of stigma associated with HIV. Recall bias was anticipated to some

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extent since clients had to remember their previous history of sexually transmitted infection, previous history of tuberculosis, previous testing for HIV, and previous use of condoms. This error was, however, minimised by using a local calendar listing the main national and religious events and other timelines as well as symptoms of the infections.

Conclusion

The proportion of those who tested positive for HIV in Sunyani Municipality was 10.3%. Out of the 46 HIV cases, 13 of them, representing 28%, reside in districts far away from the Sunyani Municipality. The factors that were significantly associated with HIV prevalence in the Sunyani and peri-urban areas in this study were previous history of syphilis infection and multiple sexual partners. Based on the findings from this study, the following recommendations are made: effective prevention interventions such as health education and behavioural change communication should be targeted and sustained. In addition, the Know Your HIV status campaign should be prioritised in high-burdened sub-districts as well as low-burdened sub-districts to sustain HIV control.

DECLARATIONS

Ethical consideration

This study received ethical approval from the Ghana Health Service Ethics Review Committee (GHS-ERC: 082/12/18), and permission was granted by the participating health facilities before the commencement of the study.

Consent to publish

All authors agreed on the content of the final paper.

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None

Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author contributions

KAW made contributions to the design, acquisition, and analysis, including interpretation of the data and drafting of the manuscript. RB and FA contributed to the manuscript's drafting, data interpretation, and critical review. BS contributed to the design, drafting, and interpretation of the data, as well as critically reviewing the manuscript for intellectual content. All authors read and approved the final manuscript.

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Availability of data

Data for this work is available upon reasonable request from the corresponding author.

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