

Decreases in human immunodeficiency virus infection rates in Kombolcha, Ethiopia: a 10-year data review

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Introduction: Acquired immunodeficiency syndrome is one of the most serious public health and development challenges in sub-Saharan Africa, including Ethiopia. A particular challenge for prevention strategies has been the emergence of hotspot areas. Therefore, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome programs should not be based on national level statistics, but need to be more focused geographically. Kombolcha is one of the high spot areas with different projects and development corridors. Hence, the aim of this study is to assess the trend of HIV infection rates among patients who visited Africa Service Committee clinic from 2005 to 2014.

Methods: An institutional-based cross-sectional study was conducted from January 1 to January 30, 2016. All records of new patients enrolled from February 8, 2005 to December 31, 2014 were reviewed. Data on sociodemographic information, risky sexual behavior, and HIV test result were collected from each study participant using data collection format. Data were analyzed using SPSS version 20.0. A multivariate logistic regression model was used to identify risk factors of HIV infection.

Results: The overall HIV infection was 10.8% (2,233/20,674). The rate of infection varied from 13.3% in 2005 to 4.5% in 2014, and its trend had significantly declined from 2008 to 2014. Urban residence (adjusted odds ratio [AOR]: 2.53; 95% confidence interval [CI]: 1.22–5.25), patients who ever had intercourse with penetration (AOR: 5.62; 95% CI: 1.11–28.57), and those who had marriage experience (AOR: 11.65; 95% CI: 4.2–32.3) were more infected with HIV.

Conclusion: The trend of HIV infection significantly reduced in the last 10 years in Kombolcha area. However, the HIV infection still remains high (4.5%) that needs intervention of those who had marriage experience, risky sexual behavior, and urban dwellers.

Keywords: HIV, infection, Kombolcha, Ethiopia

Introduction

Human immunodeficiency virus (HIV) is one of the most serious public health and development challenge in sub-Saharan Africa. HIV-1 subtype C, which mainly spreads through unprotected heterosexual intercourse, remains the predominant strain in Ethiopia.¹

In Ethiopia, the estimated number of people living with HIV was 769,602 with 15,614 new HIV infections and 35,578 acquired immunodeficiency syndrome (AIDS)-related deaths in 2014.² Moreover, the estimated national adult HIV incidence of 0.28% in 2009 translates to over 131,000 new HIV infections with urban HIV incidence ranging from 0.56% in Somali to 3.5% in Afar regions.³

The HIV epidemic may be less severe, less generalized, and more heterogeneous than previously believed. It seems to have stabilized or even declined in most of the

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major urban centers, while increasing in the smaller towns.⁴ A particular challenge for prevention strategies has been the emergence of hotspots as an unintended by-product of accelerated development schemes. These hotspots attract mobile groups, money, and opportunities for sex trade: the key ingredients known to foster epidemic spread. Mapping prevention activities and documentation of behavioral outcomes remain core activities for a responsive most at risk population HIV prevention programming at regional and district levels.⁵

The strategic plan for intensifying multisectorial HIV and AIDS response II in Ethiopia identifies female sex workers, uniformed forces, long distance drivers, never-married sexually active females, discordant couples, migrant laborers, migrant groups (especially those in small towns), cross border populations, and in-school youth (particularly at tertiary education) as most at risk populations for HIV infection.^{5,6}

For effective prevention, HIV/AIDS programs should not be based on national level statistics, but rather need to be more focused geographically and directed to those regions, districts, or communities exhibiting higher prevalence rates.⁴ Small towns are becoming hotspots and can potentially bridge further spread of HIV epidemic to rural settings.³ Kombolcha is one of the small towns assumed to be a hotspot.² Therefore, the aim of this study was to assess the trend of HIV infection rate in the proposed setting in the last 10 years.

Methods

Setting and study population

An institutional-based cross-sectional study was conducted from January 1 to January 30, 2016 among patients who visited (self-referred to) Africa Service Committee clinic (Nongovernmental Organization): Voluntary HIV Counseling and Testing center. The clinic was opened by Africa Service Committee Ethiopia at Kombolcha town, Northeast Ethiopia, on January 1, 2005. Kombolcha is located ~382 km away from Addis Ababa, the capital city of Ethiopia. According to the 2007 census, Kombolcha district has a population of 85,367, of whom 41,968 were male, and 68.7% were urban dwellers.⁷ All records of new patients with complete information (from February 8, 2005 to December 31, 2014) were reviewed. The records of patients with incomplete information were excluded. Those patient records with retesting information were also excluded to control duplication of single data.

Data collection instruments and procedure

Data on sociodemographic information, risky sexual behavior, and HIV test results of study participants were collected

using a structured data collection format. Data were collected by a nurse who had previous experience on data collection and working in a voluntary counseling and testing program.

In Africa Service Committee clinic, HIV testing was carried out using serial test algorithm: KHB (Shanghai Kehua Bio-Engineering Sarl, Shanghai, People's Republic of China) as screening, STATPACK (Chembio Diagnostic Systems, Inc., Medford, NY, USA) as confirmatory, and Uni-gold (Trinity Biotech Plc, Bray, Ireland) as tie-breaker testing kits.

Data management and analysis

Data were checked, coded, entered, and analyzed by SPSS version 20.0 (IBM Corporation, Armonk, NY, USA). Risk factors were determined only for the recent year (2014) by considering its significance for intervention. Selected variables with a P -value <0.2 were fitted to the bivariate logistic regression and further entered into multivariate logistic regression model. Backward logistic regression method was employed. Variables having a P -value <0.05 were taken as significant. Crude and adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated.

Ethical considerations

Ethical clearance was obtained from the ethical review committee of Amhara Regional Health Bureau. A official permission letter was obtained from the Amhara Regional Health Bureau and Africa Service Committee clinic, Kombolcha branch office. As we used secondary data, informed consent from individual patients was not possible. Names and medical registration numbers of patients were not included in this study.

Results

Sociodemographic characteristics

A total of 20,674 patient's records were reviewed. The median age of the patients was 22 with a range of 12–70 years. More than half (54.1%) of the participants were males. Urban residents were 12,361 (59.8%). Regarding marital status, 13,981 (67.6%) participants were never married. The majority of the patients, 12,733 (61.6%), earned less than a hundred Ethiopian Birr per month (Table 1).

Risky sexual behavior of participants

Of the total study participants, 3,742 (18.1%) reported use of alcohol/drugs/Khat. More than half of the participants, 10,801 (52.2%), ever had intercourse with penetration. Regarding respondents' perception, 1,939 (9.4%) participants did not believe condom to prevent HIV/sexually transmitted

Table 1 Sociodemographic characteristics of patients at Africa Service Committee clinic, North East Ethiopia, 2005–2014

Characteristics	Category	Frequency	Percent
Sex	Male	11,191	54.1
	Female	9,483	45.9
Age in years	<19	6,245	30.2
	20–24	6,475	31.3
	25–29	3,786	18.3
	30–34	1,547	7.5
	35–39	1,072	5.2
	40–44	551	2.7
	45–49	385	1.9
Residence	50+	613	3.0
	Urban	12,361	59.8
Marital status	Rural	8,313	40.2
	Married	2,830	13.7
Education	Never married	13,981	67.6
	Divorced	3,297	15.9
	Widowed	566	2.7
	Illiterate	4,853	23.5
Income per month (Birr)	Able to read	1,151	5.6
	1–6 primary	5,030	24.3
	7–12 secondary	8,047	38.9
	College and above	1,593	7.7
	<100	12,733	61.6
Income per month (Birr)	100–500	5,300	25.6
	501–1,000	1,710	8.3
	1,001–2,000	702	3.4
	>2,000	229	1.1

infections and 1,578 (7.6%) did not know about condom (Table 2).

HIV infection and risk factors

Of the total (20,674) new participants who tested for HIV in the last 10 years (2005–2014), the overall HIV infection rate was 10.8% (2,233/20,674). Among the total 109 participants with symptoms of sexually transmitted infections, 84 (77%) were positive for HIV. HIV infection was found in 218 (25.5%) and 253 (22.5%) from a total of 855 pregnant women and 1,120 commercial sex workers, respectively.

The rate of HIV infection ranged from 13.3% in 2005 to 4.5% in 2014, and its trend had been significantly declining since 2008 ($P < 0.05$). The trend of infection remained high among patients aged 30 years and above (Figures 1 and 2).

HIV infection was significantly higher in urban residents (AOR: 2.53; 95% CI: 1.22–5.25; $P = 0.013$). Those who had marriage experience (married, separated, divorced, and widowed) (AOR: 11.65; 95% CI: 4.2–32.3; $P < 0.001$) were also more infected from HIV (16.1% among married; 21.3% among divorced; and 30.8% among widowed) compared to never married patients (0.9%). Moreover, patients who ever had intercourse with penetration were more vulnerable

Table 2 Risky sexual behavior of participants, Africa Service Committee clinic, Kombolcha, 2005–2014

Behavior	Response	Frequency	Percent
Did the patient use alcohol/drug/Khat?	Yes	3,742	18.1
	No	16,932	81.9
Did the patient ever have intercourse with penetration?	Yes	10,801	52.2
	No	9,873	47.8
Did the patient use a condom in the last 3 months? (N=6,633)	Never	4,414	66.5
	Sometimes	609	9.2
	Always	1,610	24.3
Did the patient use a condom last time to have intercourse? (N=10,131)	Yes	3,638	35.9
	No	6,493	64.1
Did the patient believe a condom prevents HIV/STI?	Yes	17,157	83.0
	No	1,939	9.4
	Do not know	1,578	7.6
Is the patient a CSW? (N=7,509)	Yes	1,120	14.9
	No	6,389	85.1
Did the patient exchange intercourse for material assistance? (N=10,188)	Yes	1,273	12.5
	No	8,915	87.5

Abbreviations: CSW, commercial sex worker; HIV, human immunodeficiency virus; STI, sexually transmitted infections.

(AOR: 5.62; 95% CI: 1.11–28.57; $P = 0.037$) for HIV infection (Table 3).

Discussion

HIV infection rate is declining in Kombolcha, Ethiopia. The infection rate significantly fell from 13.3% in 2005 to 4.5% in 2014. This in line with the national data where there is a 90% reduction in HIV incidence since the introduction of President's Emergency Plan for AIDS Relief (PEPFAR) in Ethiopia in 2005.⁸ Despite the significant decline in the setting, the current incidence rate (4.5%) is still unacceptable as compared to the national estimate, which is 0.04% in urban population. This difference might be attributed to the setting as Kombolcha is a geographic hotspot where most at risk populations are plentiful.² Moreover, higher prevalence of HIV was found among pregnant women (22.5%). This might be due to having unsafe sexual exposure to become pregnant. As part of the Prevention of Mother-to-Child Transmission (PMTCT)

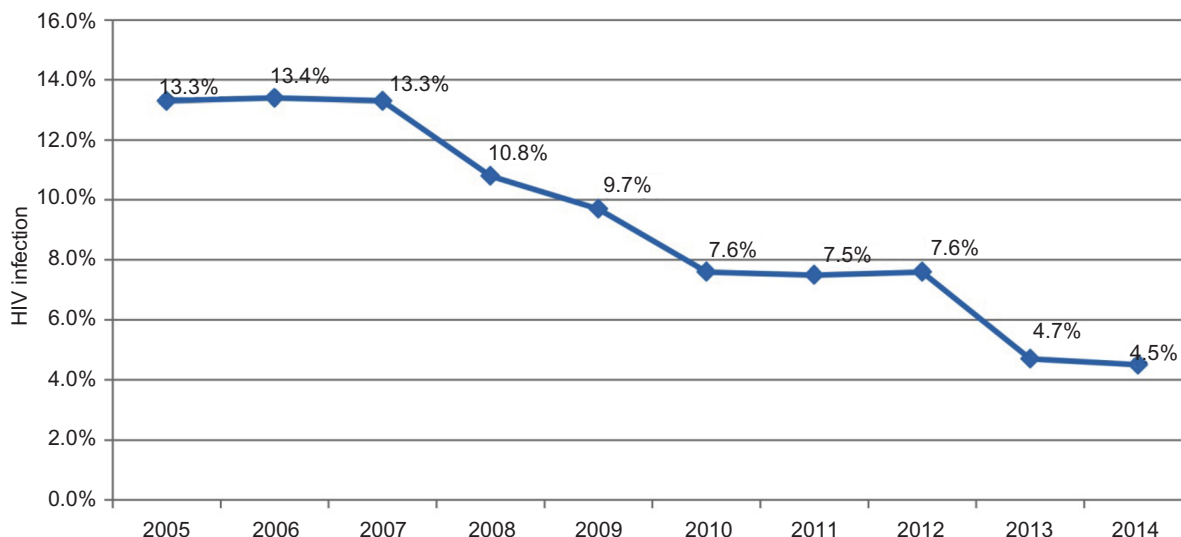


Figure 1 Trend of human immunodeficiency virus (HIV) infection among patients tested for HIV at Africa Service Committee clinic, Kombolcha, 2005–2014.

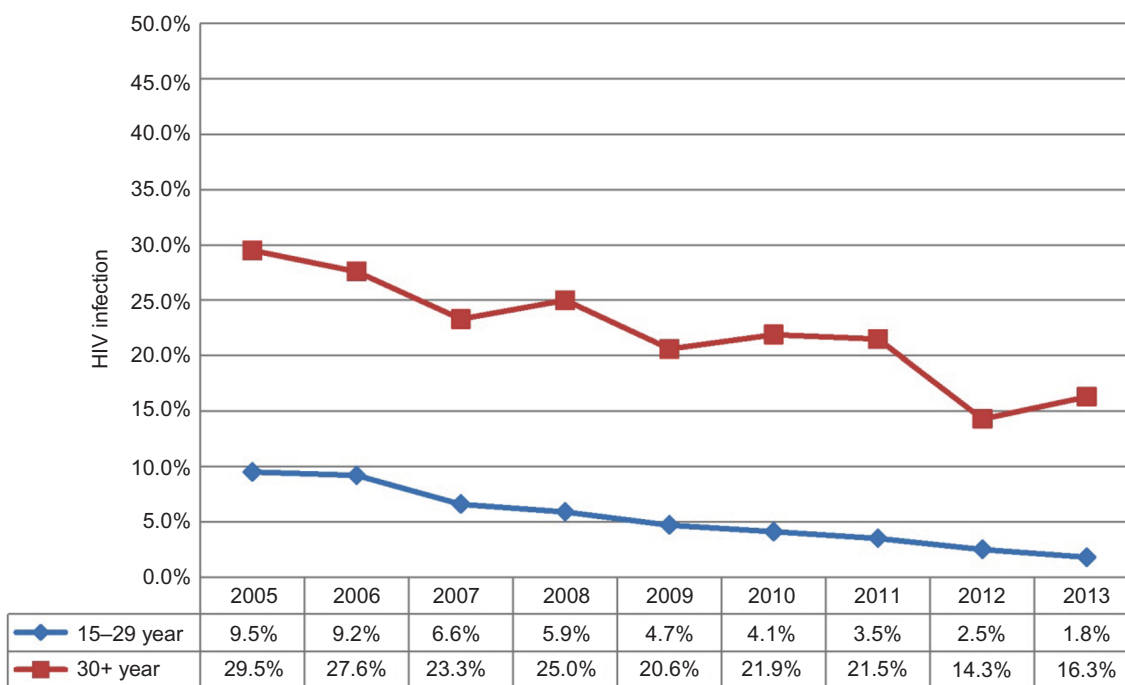


Figure 2 Trend of human immunodeficiency virus (HIV) infection with age group of patients tested for HIV at Africa Service Committee, Kombolcha, 2005–2014.

program, the increased HIV counseling of all pregnant women by the health extension workers to get tested may also increase the probability of getting HIV-positive ones. This study has found that urban dwellers were significantly more infected than rural dwellers. This is also similarly reported from the Ethiopian demographic and health survey 2011 that showed an HIV prevalence of 4.2% in urban and 0.6% in rural.⁹ Moreover, antenatal statistics in sub-Saharan Africa consistently show higher HIV prevalence in urban than in rural areas. This might be due to a combination of higher levels of mobility and sexual networking than in rural communities.¹⁰

In this study, patients with at least one marriage experience had significantly higher HIV infection compared to never married patients. The Ethiopia Demographic and Health Survey (EDHS) 2011 has also shown that there is an HIV prevalence variation by marital status (0.3% among never married; 1.5% among married/living together; 5.2% among divorced/separated; and 12.2% among widowed).⁹ Moreover, married people were identified as the most risky group for HIV infection in the Uganda HIV/AIDS sero-behavioral survey.¹¹ This difference may be caused by unawareness of their HIV status, engaging in sex with multiple partners, and their reluctance to use con-

Table 3 Risk factors of HIV infection in Kombolcha, 2014

Variables	Category	HIV status		COR (95% CI)	AOR (95% CI)	P-value
		Negative	Positive			
Residence	Urban	309	23	2.57 (1.30–5.08)	2.53 (1.22–5.25)	0.013
	Rural	484	14			
Sex	Male	470	18			
	Female	323	19	1.54 (0.79–2.97)	-	-
Marital status	Never married	663	6			
	Married at least once	130	31	26.4 (10.8–64.4)	11.65 (4.2–32.3)	<0.001
Age, years	15–29	665	12		-	-
	30+	128	25	10.8 (5.3–22.1)	-	-
Did the patient use alcohol/drug/Khat?	Yes	171	13	1.97 (0.98–3.95)	-	-
	No	622	24			
Did the patient ever have intercourse with penetration?	Yes	310	35	27.3 (6.5–114.2)	5.62 (1.11–28.57)	0.037
	No	483	2			

Note: Hosmer and Lemeshow model fit: $\chi^2=2.314$, $P=0.678$. Variables having P -value<0.05 in the multivariate analysis were taken as significant association with HIV infection. **Abbreviations:** AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; HIV, human immunodeficiency virus.

doms. Whereas, the low rate of infection among unmarried people is ascribed to their vigilance in having protected sex.¹²

In the present study, patients who had intercourse with penetration were more likely to contract HIV than their counterparts. Longer and rougher sex can irritate the mucous membrane thereby increasing the likelihood of viral transmission. Safe sexual behavior in which the exposure of infectious body fluids is minimized, such as intercourse using a condom, reduces risk.^{13,14}

The limitation of this study was the lack of data for some additional variables that may have an important input to identify risk factors of HIV infection.

Conclusion

Despite the trend of HIV infection rate being significantly reduced in the last 10 years in Kombolcha area, the infection still remains high (4.5%). Having intercourse with penetration, marriage experience, and urban resident were factors for HIV infection. Hence, this needs intervention especially in those who have risky sexual behavior, marriage experience, and are urban residents.

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Author contributions

MBS, GBG, MAS, and YAY designed the study, collected the data, performed the statistical analysis, and drafted the

manuscript. All authors read and approved the final manuscript. All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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