

# Trends of HIV/AIDS Infection in Arsi Zone from 2002-2008 E.C (2010 to 2016 G.C), Oromia Region Ethiopia: Evidence from VCT Registry

Mesfin Segni Tafa (✉ [mesfintafa2011@gmail.com](mailto:mesfintafa2011@gmail.com))

Arsi University College of Health Sciences <https://orcid.org/0000-0001-5082-484X>

Hailu Fekadu

Martha Aseffa

Hirpo Teno

---

## Research

**Keywords:** HIV/AIDS, Ethiopia, Arsi Zone, VCT

**Posted Date:** July 2nd, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-38252/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

# Abstract

**Introduction:** HIV continues to be a major global public health issue, having claimed more than 35 million lives so far. Globally, about 36.7 million people living with HIV currently, more than two third of the infection is the burden of Sub-Saharan Africa. Knowing the status of HIV/AIDS has the great value to individual health of treatment with ART and in terms of reductions in individual morbidity and mortality, and is equally cost-effective. Therefore, the aim of this study was to assess trends and associated factor of HIV infection in Arsi zone from 2010 to 2016.

**Methodology:** A retrospective study was conducted in Arsi zone. Thirty health facilities (27 health centers and 3 Hospitals) were selected for the study from all woreda in the Zone. A total of 205,691 data was collected from VCT registration book. Data were entered into computer using Epi info 3.5.4 and exported for analysis to SPSS 21. Data were presented using tables and figures using line graphs. Logistic regression was used to see the association and significance was declared at  $P\text{-value} < 0.05$

**Result:** The study showed a total of 4300 HIV positive cases were reported between 2002(2009 G.C) to 2008(2016 G.C) according to available VCT registration book during survey at 30 health facilities. The trends of HIV of infection were not properly defined, it was 3.4% in 2002(2010 G.C ) and mean while a gradual drop has been observed in the next five consecutive years, almost which was less than 2% prevalence and in 2008 the prevalence was raised to 2.4% compared to 2007 and before. The changes in HIV prevalence were uneven among districts. Findings from logistic regression analysis indicated that the fitted demographic characteristics like, marital status, age and occupation were significantly associated with HIV positivity in both bivariate and multivariate analysis.

**Conclusion:** There are no encouraging indications that the HIV prevalence has decreasing since there were variation among districts. Therefore there is a need of designing comprehensive strategy to combat the spread of HIV infections among all individuals. It is also important to strengthening VCT services at all level with strict follow up.

## 1. Introduction

The acquired immunodeficiency syndrome (AIDS) since its first recognition among five homosexual men in the United States, Los Angeles in 1981 and continually a major global Public Health issue, having claimed more than 35 million lives so far(1–3). The AIDS epidemic now ranks alongside the influenza pandemic of the early 1900s and the Bubonic plague of the 14th century in terms of fatalities(1).

Globally currently about 37.9 million people living with HIV, 1.7 million newly infected and 770,000 died from HIV at the end of 2018. Sub-Saharan Africa is the most affected region, with 25.6 (22.2–29.5) million people living with HIV in 2018. Also sub-Saharan Africa accounts for two-thirds of the global total of new HIV infections. Between 2000 and 2018, new HIV infections fell by 37%, AIDS-related deaths fell by 45% and 13.6 million lives saved(3, 4).

Declines in new HIV infections among adults have slowed alarmingly in recent years, with the estimated annual number of new infections among adults remaining nearly, static at about 1.9 million (1.7 million–

2.2 million) in 2015. But there are different disparities across regions, within countries, between men and women and young and old, and among specific populations being left behind. These disparities must be addressed in order to achieve the reductions required to end the AIDS epidemic as a public health threat by 2030. Even though still the magnitude of HIV is high, the largest reduction in new adult HIV infections occurred in eastern and southern Africa. There were about 40 000 fewer new adult HIV infections in the region in 2015 than in 2010, a 4% decline. More gradual declines were achieved in the Asia and Pacific region and western and central Africa. Rates of new adult HIV infections were relatively static in Latin America and the Caribbean, western and central Europe, North America and the Middle East and North Africa, while the annual numbers of new HIV infections in Eastern Europe and central Asia increased by 57%(5).

Under Sustainable Development Goal 3, the global community has agreed to aim to end the AIDS epidemic by 2030(6), and under the UNAIDS “90-90-90” targets, countries work toward achieving, by 2020, “90% of people living with HIV knowing their HIV status; 90% of people who know their HIV-positive status on treatment; and 90% of people on treatment with suppressed viral loads(5).

AIDS is now affecting all sectors of Ethiopian society. The future course of the AIDS epidemic in Ethiopia depends on a number of factors including HIV/AIDS-related knowledge, social stigmatization, risk behavior modification, access to high-quality services for sexually transmitted infections (STIs), provision and uptake of HIV counseling and testing, and access to antiretroviral therapy (ART)(7, 8).

The geographical structure of HIV epidemic is the consequence of drivers of the epidemic and the availability of susceptible population to the infection, strongest clustering has been observed in countries with a low national prevalence of HIV infection. The ‘know your epidemic’ concept recognizes this geographical feature as a key strategy in identifying populations at higher risk of HIV infection and in which prevention interventions should be targeted(9).

As with all generalized HIV/AIDS epidemics, heterosexual transmission is the primary mode of HIV transmission in the region and female commercial sex workers (CSW) remain a key population for HIV prevention efforts. Within Africa, the potential importance of men who have sex with men (MSM), in terms of enhanced HIV transmission among MSM sexual networks and ‘bridging’ into heterosexual sexual networks, is only now being recognized and MSM research remains in its infancy(10)..

The current moment is one of great optimism in HIV prevention. Breakthroughs in HIV treatment, prevention science, program implementation and human rights realization have led to assertions that “an AIDS free generation” is possible that Advances in HIV prevention(11).

The main drivers of the epidemic to explain the overall trends in the country have not been described. It is also not known whether the main transmission determinants differ by sex or differ between rural and urban areas. Understanding the direction of the change in HIV prevalence, along with various drivers of HIV transmission in different populations and areas of the country, is of paramount importance in intervention design, evaluation, and scale-up, [UNAIDS and WHO 2011].

The impact of HIV/AIDS on human suffering, cultures, demographics, economics, and even politics has been felt in nearly every society across worldwide. Monitoring a localized HIV/AIDS epidemic is important for more

effective prevention strategies. In Ethiopia even though adult HIV prevalence has declined at the national level, little information is available about the sub geographic areas and certain subpopulation groups in the country. Majority of the individual studies conducted HIV/AIDS previously emphasis on prevalence and risk factor at a point time(), did not indicated the trend for many years HIV infection using large sample size. The finding of this study would indicate the past and current infection rate in Arsi Zone that might help program planners to design and integrated prevention and control strategies. Therefore, this study was intended to assess the trends and Associated factors of HIV infection in Arsi zone from VCT Registry from 2010 to 2016 in Ethiopia.

## 2. Methods

### Study setting

The study was undertaken in Arsi Zone Oromiya regional state from May 2016 to October 2016. The zone shares boundaries with East Showa, West Hararghe, Bale and West Arsi Zones. Asella is the capital town of Arsi Zone, which is located 175 km South East of Addis Ababa capital of the country. Based on 2007 Housing and population census projection, the total population of Arsi is projected to be 3,280,667 million in 2016, of which 90% of the population is estimated to be rural residents. Administratively, the zone is divided into 25, woredas and 2 administrative towns having an area of 23,679.7 km<sup>2</sup>. The average altitude ranges from 1700 to 4000 meters above sea level. The average temperature varies from 10 to 24<sup>0</sup>C.

The 9 months report (from September to May 2008 E.C) about 209,876 people tested for HIV, of this 42,898 received testing from VCT service and 166,978 from PITC. Clients testing positive for HIV (at VCT) were 276, Clients testing positive for HIV (at PITC) were 351, Number of adults and children with HIV infection newly enrolled in Pre ART care were 444, Number of adults and children with advanced HIV infection ever started on ART were 4621 Number of adults and children who are currently on ART were 4034(Arsi Zone Health Department report 2016).

### Study design

Health institutions based retrospective study design was employed to extract data from VCT registry.

### Study population

All clients registered on VCT registry book from September 2002 to August 2008 from those selected health facilities (Health Center and Hospital) were included.

### Exclusion Criteria

- Records that did not have complete information especially on the test result relevant for the study.

### Sample size and Sampling procedure:

All participants with complete information from the registry book were included from September 2002 to August 2008 E.C. About, two hundred thousand six (205,691) participants were included. From 100 health

centers found in the woreda, 27 health centers (Health Centers located in the woreda town) and 3 Hospitals were selected purposively those giving ART and VCT services.. The majority of health centers found outside the district town were established recently (< 5 years) and they were not delivering ART service and have no organized VCT registration book during the assessment.

## **Study Variables**

**Dependent variable:** HIV test result

**Independent Variables:** Age, sex, Occupation, marital status and Religion

## **Data collection procedures and quality Assurance**

### **Instrument(Questionnaires)**

Data collection format(checklist) was prepared to extract the necessary information for the study based on the VCT registration form of Federal Ministry of Health (FMOH). Thirty one (31) data collectors(community health counselors, Health Officers, Nurses and Midwives who are working on the VCT were recruited. Pre arrangement was done by communicating with the respective health facility leader.

Data collectors were oriented how to fill the questioners from the registry. The completeness of the filled questionnaires were randomly selected and cross checked with the information VCT registry.

## **Statistical Analysis**

The variables were coded and entered into computer using Epi info version 3.5.4 software by data clerk and then transported to SPSS version 21 software for Analysis. Data was Cleaned and checked for missing values, outliers and for any inconsistency before running the analysis. Descriptive statistics using frequency and percentage was used to describe the pattern of occurrence of HIV infection. Cross tabulation was done to see differences between different characteristics. Row total was taken to know percentage. Logistic regression was used to identify some of sociodemographic predictors of HIV infection and difference of HIV prevalence between Health facility. Odds ratio(OR) both Crude and Adjusted odds ratio with 95% confidence interval(CI) at P-value less than 0.005 was considered to declare significant association. After obtaining percentages using SPSS, Microsoft office Excels Worksheet on a window 2010 was used to show trends of HIV infection.

## **Ethical consideration**

Support letter was obtained from Arsi University College of Health Sciences, Research and community service coordinator and submitted to respective health facilities. Since data were extracted from registry, no need of further informed consent from the participants since code was used to represent individual information in the registration book.

## **Result**

## **Socio-demographics Characteristics of the Respondents**

A total of 205,691 data were collected from the 30 selected facilities from available registry. The detail of information is presented below in Table 1.

Table 1

Total participants visited health facility for VCT as collected from the registration book from 2002–2008 E.C (2010 to 2016 G.C)

Facility Name	Year							Total
	2002	2003	2004	2005	2006	2007	2008	
Asella Hospital	7624	6532	4643	3527	3432	3767	1411	30936
Assela HC	5505	6111	8261	9748	8036	8410	1997	48068
Abomsa Hospital		140	802	484	1070	772	612	3880
Shirka HC	-	-	218	1508	1176	1356	1220	5478
Eteya HC	1241	1008	0	297	463	864	172	4045
Bele HC	-	-	394	138	145	119	131	927
Abajema HC	4182	2151	1787	482	353	138	100	9193
Sire HC	1182	763	826	587	734	1507	287	5886
Sagure HC	-	-	-	142	861	617	172	1792
Abomsa HC	-	-	668	1473	86	241	425	2893
Diksis HC	1931	-	1774	324	258	312	196	4795
Arboye HC	-	-	960	1394	453	1410	1625	5842
Bokoji HC	3884	4495	2476	1048	463	991	960	14317
Dera HC	1660	1447	2702	1635	2197	2881	2024	14546
Bokoji Hospital							308	308
Siltana HC	-	-	399	448	600	1344	60	2851
Robe HC	81	-	2741	1618	0	690	157	5287
Meraro HC	1591	310	1833	732	1246	760	169	6641
Robe Hospital			1018	926	478	576	258	3256
Ticho HC	-	-	644	300	107	170	70	1291
Kersa HC	1411	1580	1233	831	515	271	433	6274
Kula HC	215	-	-	660	89	-	-	964
Huruta HC	360	562	1278	1036	816	634	423	5109
Ogolcho HC	-	-	-	-	-	81	63	144
Aseko HC	-	-	794	712	-	-	-	1506

N.B: shaded part indicates the test not done

Facility Name	Year							Total
	2002	2003	2004	2005	2006	2007	2008	
Gonde HC	-	-	-	1816	1852	1788	473	5929
Chancho HC	-	-	-	-	48	67	144	259
Chole HC	688	270	834	124	462	212	463	3053
Seru HC	41	947	850	1309	1339	561	249	5296
Adele HC	1243	-	325	1524	1538	262	32	4924
<b>Total</b>	<b>32839</b>	<b>26317</b>	<b>37460</b>	<b>34823</b>	<b>28817</b>	<b>30801</b>	<b>14634</b>	<b>205691</b>
N.B: shaded part indicates the test not done								

The mean age of the VCT attendants was  $26.3 \pm 9.9$ . Majority (57.1%) of the participants found in the group of 35 to 49 years old. Fifty five percent were male participants. Concerning marital status, data was recorded only for 38,390 participants, of these participants, more than half of the participants (54.2%) were single and about 40% of were married. More than three quarters of the participants were orthodox and 3346(22.6%) were Muslims (Table 2).

Table 2  
 Socio-demographic characteristics of VCT  
 attendants in Arsi Zone from 2008–2008 E.C  
 (2010 to 2016 G.C).

Variable	Frequency	Percentage
Age		
<20	53,141	25.8
20–34	117,494	57.1
35–49	26,940	13.1
50–64	6,628	3.2
>=65	1,488	.7
Mean ± SD	26.3 ± 9.9	
Sex		
Male	113034	55.0
Female	92657	45.0
Marital Status		
Single	20,994	54.2
Married	15332	39.6
Widowed	341	0.9
Divorced	1504	3.9
Separated	560	1.4
Religion		
Orthodox	10073	68.0
Muslim	3346	22.6
Protestant	1329	9.0
Other	69	0.5
Occupation		
Student	14755	43.5
Employed	2263	6.7
Farmer	5305	15.6
Housewife	3472	10.2
Merchant	1467	4.3

Variable	Frequency	Percentage
Driver	466	1.4
Daily Worker	2121	6.3
CSW	77	.2
Other	3991	11.8

### Overall Trends of HIV infection in Arsi Zone

As shown in Table 3 below, small numbers (14634) of participants were screened in 2008 and large numbers were screened in 2004 and in 2005.

Table 3  
Overall Trends of HIV infection in Arsi Zone from 2002–2008 E.C (2010 to 2016G.C)

	Year-							Total
	2002	2003	2004	2005	2006	2007	2008	
<b>Total tested</b>	32839	26317	37460	34823	28817	30801	14634	205691
Male	18699	14097	20320	18906	16066	16882	8064	113034
Female	14140	12220	17140	15917	12751	13919	6570	92657
<b>Total HIV +</b>	1109(3.4)	542(2.1)	634(1.7)	622(1.8)	557(1.9)	478(1.6)	358(2.4)	4300(2.1)

The prevalence of HIV was high (3.4%) in 2002, mean while a gradual drop has been observed in the next five consecutive years, almost which was less than 2% prevalence and in 2008 the prevalence was raised to 2.4% compared to 2007 and before.

As depicted in the Fig. 1 above, the proportion of the overall trends of HIV showed that a moderate declining from 2002 to 2004 and was almost similar fashion in the next three consecutive years until 2006 and somewhat decreased in 2007 and raised in 2008. Overall, the incidence the infection is constant as observed in the figure.

### Trend of HIV/AIDs among by sex

There was consistent discrepancy of trend of HIV infection with regard to sex. In general, the magnitude of the HIV infection was higher among females, which was more than 2% as the trend reflects (i.e. in 2002 (4.5%), in 2003(2.6), in 2004(2.1%)) as displayed in Table 4 and in Fig. 2 below.

Table 4  
Trends of HIV infection in Arsi Zone from 2002–2008 E.C ( 2010 to 2016 G.C)by sex

	Year							Total
	2002	2003	2004	2005	2006	2007	2008	
<b>Total HIV +</b>	1109(3.4)	542(2.1)	634(1.7)	622(1.8)	557(1.9)	478(1.6)	358(2.4)	4300(2.1)
<b>Sex</b>								
Male	477(2.6)	225(1.6)	266(1.3)	237(1.3)	240(1.5)	190(1.1)	168(2.1)	1803(1.6)
Female	632(4.5)	317(2.6)	368(2.1)	385(2.4)	317(2.5)	288(2.1)	190(2.9)	2497(2.7)

### Trends of HIV/AIDS prevalence in relation to Age

Comparing the trends of HIV infection by considering age, it shows inconstant prevalence of HIV infection. It dint show constantly decreasing for example for age group 35–49, the prevalence was in 2002 and decreased to 5.4% in 2003, 3.8% in 2004 and slightly increased by 0.2% from immediate previous years and decreased by 0.4 in the next two years in 2006 and 2007 struck by 1.6% in 2008. But in the age group of 20–34, the prevalence was 3.6% in 2002 and decreased to 2.3% in 2003 it was dropped by half in 2004 and static magnitude was observed for three years which was 1.6%. It is also substantial proportion of age above 64 were affected by the epidemic in the last seven years (Table 5).

Table 5  
Trends of HIV infection in Arsi Zone from 2002-2008E.C (2010 to 2016 G.C) by Age

	Year							Total
	2002	2003	2004	2005	2006	2007	2008	
<b>Total HIV +</b>	1109(3.4)	542(2.1)	634(1.7)	622(1.8)	557(1.9)	478(1.6)	358(2.4)	4300(2.1)
<b>Age group</b>								
< 20	179(1.7)	79(0.8)	58(0.6)	73(0.9)	72(1.2)	47(0.8)	51(1.9)	
20–34	604(3.6)	295(2.3)	349(1.6)	322(1.60)	286(1.60)	244(1.3)	162(1.8)	
35–49	240(6.3)	136(5.4)	178(3.8)	186(4.0)	157(3.6)	148(3.2)	116(4.8)	
50–64	69(5.6)	25(3.00)	42(3.7)	37(3.5)	31(3.6)	35(3.5)	21(4.1)	
>=65	17(5.8)	7(4.7)	7(2.7)	4(2.0)	11(4.6)	4(2.0)	8(6.1)	

Figure 3 shows the pattern of HIV occurrence among VCT attendants in relation to age. The patterns in HIV incidence in various age-groups were not well defined, which showed a decreasing a among young ages until

2007 and raised in 2008 and among older group the incidence as general high and showed a mixture of peak and down at different years but in all peaked in 2008.

### **Association of HIV infection with Socio-demographic factors**

Socio-demographic characteristics like marital status, sex, occupation and age were included in bivariate and multiple logistic regressions to see the association with HIV/AIDS infection. All these characteristics showed that significantly associated with HIV infection in the bivariate analysis, meanwhile to control confounding effect all these variables were entered together in the multiple logistic regression they were also significantly associated.

With regard to gender relation with HIV infection, in this report females were more likely to be HIV positive than male (AOR = 1.42, 95% CI = 1.24,1.64). When we see marital status as independent factor, the risk of HIV infection was higher among formerly married (widowed/divorced/separated) (AOR = 2.43, 95%CI = 1.99, 2.98) compared to single. Though the strength of association is moderate, the likelihood of HIV positive was 1.43 times more likely among currently married and in union compared to unmarried ones (AOR = 1.43, 95%CI = 1.21, 1.70).

Occupation showed that an association with the HIV positivity. A significantly strong association of HIV positive was observed among commercial sex workers. The odds of acquiring HIV infection was more than 3 times more likely among commercial sex workers (AOR = 3.30, 95%CI = 1.52, 7.16). There was also significantly association with daily workers and house wife; the risk of infection was two times higher among daily workers (AOR = 1.95, 95%CI = 1.52, 2.50) and 1.6 times higher among housewife (AOR = 1.62, 95%CI = 1.28,2.05).

The odds of being infected by HIV/AIDS infection was higher among older people compared to younger age group. Participants found in age above 35 were more than 3 times more likely to get HIV/AIDS compared to younger age group, the AOR with 95% is as following (age 35–49, AOR = 3.17, 95%CI = 2.49,4.02); age 50–64,AOR = 3.35, 95%CI = 2.43,4.63); age > = 65,AOR = 3.20, 95%CI = 1.78,5.77)(Table 6).

Table 6

Association of HIV infection with some of Socio-demographic characteristics at Arsi Zone

Characteristics	HIV test Result		Odds Ratio	
	Negative	Positive	COR95%CI	AOR95%CI
<b>Marital Status</b>				
Single	20575(98.0%)	419(2.0%)	1	1
Married	14755(96.2%)	577(3.8%)	1.92(1.70,2.20)	<b>1.43(1.21,1.70)</b>
Widowed/divorced /separate	2178(90.6)	227(9.4)	5.12(4.33,6.05)	<b>2.43(1.99,2.98)</b>
<b>Sex</b>				
Male	111231(98.4)	1803(1.6)	1	
Female	90160(97.3)	2497(2.7)	<b>1.71(1.61,1.82)</b>	<b>1.42(1.24,1.64)</b>
<b>Occupation</b>				
Student	14471(98.1)	284(1.9)	<b>0.53(0.43,0.65)</b>	0.90(0.71,1.14)
Employed	2168(95.8)	95(4.2)	1.18(0.91,1.54)	1.18(0.89,1.56)
Farmer	5083(95.8)	222(4.2)	1.18(0.95,1.46)	1.08(0.86,1.36)
Housewife	3181(91.6)	291(8.4)	<b>2.46(2.00,3.02)</b>	<b>1.62(1.28,2.05)</b>
Merchant	1403(95.6)	64(4.4)	1.23(0.91,1.66)	1.04(0.75,1.44)
Driver	451(96.8)	15(3.2)	0.90(0.52,1.54)	1.17(0.66,2.06)
Daily Worker	1979(93.3)	142(6.7)	<b>1.93(1.52,2.45)</b>	<b>1.95(1.52, 2.50)</b>
CSW	69(89.6)	8(10.4)	<b>3.12(1.47,6.61)</b>	<b>3.30(1.52,7.16)</b>
Other	3848(96.4)	143(3.6)	1	1
<b>Age Group</b>				
<20	52582(98.9)	559(1.1)	1	1
20–34	115232(98.1)	2262(1.9)	1.85(1.68,2.03)	<b>1.52(1.25,1.84)</b>
35–49	25779(95.1)	1161(4.3)	<b>4.24(3.84,4.69)</b>	<b>3.17(2.49,4.02)</b>
50–64	6368(96.1)	260(3.9)	3.84(3.31,4.46)	<b>3.35(2.43,4.63)</b>
>64	1430(96.1)	58(3.9)	3.82(2.90,5.03)	<b>3.20(1.78,5.77)</b>

Facility (district) disparity of HIV infection in Arsi zone

Logistic regression was performed to see facility (district) disparity of the prevalence of HIV infection taking Adele health center as reference. As displayed in table – below high prevalence was observed at the following facilities; Robe hospital(P-value = 0.0001, OR = 10.55,95%CI = 3.70,15.85), Abomsa Hospital(p-value = 0.0001, OR = 7.24,95%CI = 4.80, 10.94), Assela Hospital(P-value < 0.0001, OR = 8.85,95%CI = 6.04,12.96), Bokoji Hospital (P-value = 0.0001, OR = 7.99, 95%CI = 4.08, 15.65), Bele health center(P-value = 0.0001,OR = 8.39, 95%CI = 5.14,13.71), Ogolcho Health center((P-value = 0.0001, OR = 6.52,95%CI = 2.48,17.19), Eteya Health center(P-value = 0.0001, OR = 5.74,95%CI = 3.78,8.72), Dera Health center (P-value = 0.0001, OR = 4.47, 95%CI = 3.02,6.62), Huruta Health center(P-value = 0.0001, OR = 4.18,95%CI = 2.74,6.36), Bokoji Health Center(P-value = 0.0001, OR = 3.63,95%CI = 2.44,5.40), Kersa health center(P-value = 0.0001, OR = 5.14,95%CI = 3.42,7.73), Robe Health center(P-value = 0.0001, OR = 3.26, 95%CI = 2.26,5.31), Aseko Health center(P-value = 0.0001, OR = 3.31, 95%CI = 1.94,5.66),Assela Health center(P-value < 0.0001, OR = 3.18, 95%CI = 2.16,4.66).

No significant difference was observed like Shirka Health Center, Abajema Health center, Meraro Health Center, Kula Health center, Gonde Health Center, Chanco Health Center and Cholle Health Center(Table 7).

Table 7

The proportion of HIV infection among VCT attendants at specific facilities from 2002–2008  
E.C (2010 to 2016 G.C) .

Facility Name	HIV Test Result		P-value	Odds ratio	95%CI	
	Negative	Positive			Lower	Upper
Asella Hospital	29497(95.3)	1439(4.7)	.0001	<b>8.85</b>	<b>6.04</b>	<b>12.96</b>
Assela HC	47241(98.3)	827(1.7)	.0001	<b>3.18</b>	<b>2.16</b>	<b>4.66</b>
Abomsa Hospital	3731(96.2)	149(3.8)	.0001	<b>7.24</b>	<b>4.80</b>	<b>10.94</b>
Shirka HC	5457(99.6)	21(0.4)	.218	.70	.39	1.24
Eteya HC	3921(96.9)	124(3.1)	.0001	<b>5.74</b>	<b>3.78</b>	<b>8.72</b>
Bele HC	886(95.6)	41(4.4)	.0001	<b>8.39</b>	<b>5.14</b>	<b>13.71</b>
Abajema HC	9139(99.4)	54(0.6)	.770	1.07	.67	1.70
Sire HC	5826(99.0)	60(1.0)	.007	1.87	1.18	2.95
Sagure HC	1771(98.8)	21(1.2)	.009	2.15	1.21	3.81
Abomsa HC	2857(98.8)	36(1.2)	.001	2.29	1.39	3.77
Diksis HC	4720(98.4)	75(1.6)	.0001	2.88	1.85	4.48
Arboye HC	5821(99.6)	21(0.4)	.146	.65	.37	1.16
Bokoji HC	14036(98.0)	281(2.0)	.0001	<b>3.63</b>	<b>2.44</b>	<b>5.40</b>
Dera HC	14196(97.6)	350(2.4)	.0001	<b>4.47</b>	<b>3.02</b>	<b>6.62</b>
Bokoji Hospital	295(95.8)	13(4.2)	.0001	<b>7.99</b>	<b>4.08</b>	<b>15.65</b>
Siltana HC	2820(98.9)	31(1.1)	.009	1.99	1.19	3.35
Robe HC	5188(98.1)	99(1.9)	.0001	<b>3.46</b>	<b>2.26</b>	<b>5.31</b>
Meraro HC	6600(99.4)	41(0.6)	.631	1.13	.69	1.83
Robe Hospital	3077(94.5)	179(5.5)	.0001	<b>10.55</b>	<b>7.02</b>	<b>15.85</b>
Ticho HC	1274(98.7)	17(1.3)	.005	2.42	1.32	4.45
Kersa HC	6101(97.2)	173(2.8)	.0001	<b>5.14</b>	<b>3.42</b>	<b>7.73</b>
Kula HC	955(99.1)	9(0.9)	.165	1.71	.80	3.65
Huruta HC	4994(97.7)	115(2.3)	.0001	<b>4.18</b>	<b>2.74</b>	<b>6.36</b>
Ogolcho HC	139(96.5)	5(3.5)	.0001	<b>6.52</b>	<b>2.48</b>	<b>17.19</b>
Aseko HC	1479(98.2)	27(1.8)	.0001	<b>3.31</b>	<b>1.94</b>	<b>5.66</b>
Gonde HC	5902(99.5)	28(0.5)	.578	.86	.51	1.46

Facility Name	HIV Test Result		P-value	Odds ratio	95%CI	
	Negative	Positive			Lower	Upper
Chancho HC	255(98.5)	4(1.5)	.053	2.85	.99	8.19
Chole HC	3035(99.4)	18(0.6)	.811	1.08	.59	1.96
Seru HC	5281(99.7)	15(0.3)	.040	.52	.27	.97
Adele HC	4897(99.5)	27(0.5)	000	1(constant)		

### Trends of HIV infection by specific Health facility (Area).

Under this section, Analysis was performed to see trends of HIV infection at specific health facilities. We tried to categorized health centers with good record keeping and weak registration system (unviability of full registration book for some years).

#### Facilities having data(Good data handling system) from 2002 to 2008 E.C (2010–2016 G.C)

Assela Referral and Teaching Hospital, Assela Health Center, Dera Health Center, Kersa Health center, Sire Health Center, Abomsa Hospital, Robe Hospital, Seru Health Center, Chole Health Center, Bokoji Health Center, Huruta Health Center, Abomsa Hospital, Abajema Health Center, Meraro Health Center, Gonde Health Center, Bokoji Hospital. As displayed in the graphs in the majority of health facilities the incidence of HIV infection showed an increasing, except in few health facilities like Seru Health Center and Gonde Health Center where it reflected decreasing ,and in the other facilities it indicated variable incidences, it peaks in some year and fall in the other years. Badly the incidence of the disease is increasing at facilities like Robe Hospital, Abomsa Hospital, Huruta Health Center and Kersa Health Center. More than 3% of prevalence is observed in Assela Referral and Teaching Hospital, Robe Hospital, Abomsa Hospital and Kersa Health Center. In opposite of these facilities, low incidence, which was almost a constant 0.6% was observed at Abajema Health center(Guna Woreda).

(Detailed trend for each facility is presented under supplementary document)

#### Facilities with poor data handling system

More than 50% of the sampled health facilities have some problem of handling the recoded data properly. Especially from the following Health Facilities, Ogolcho Health Center from Ziway dugda wored, Kula Health center from Sude Woreda, Chancho Health center from Gololcha Health Center, Aseko Health Center from Aseko Woreda have less three years data during the assessment. Health centers like Hamda Diksis, Adele Health center and Eteya health Center have no data for one year. Other health centers such as; Robe Health center, Bele Health center, Shirka Health center, Siltana Health Center, Sagure Health center, Ticho Health Center, Arboye Health center and Abomsa Health center have no data from 2 to 3 years.

High prevalence of the infection was seen at Eteya, Robe and Bele Health centers which was more 2% and in majority of facilities the epidemic curve showed a steady increasing, but in contrast of this at Sagure Health center, the incidence of HIV infection is decreasing. For detail, the information for each health facility is

presented as follow separately in tables to show the magnitude of problem (under supplementary information).

## Discussion

The spontaneous spread of the HIV is a worldwide health challenge since its discovery before three decades and has lasted a great devastating consequence on socio economic growth. Globally the pandemic of HIV is becoming lesser, but still there is a substantial effect of the diseases at different segment of population especially those living in developing country. In our country context, as general report there was a drastic fell of HIV infection, but still there is no individual report that reflect specific area intensively. There is also a problem of handling reports (data) properly for a long time for the area which will help to trace the magnitude of the problem when needed. The reason why we conducted this study was to see the trends of HIV infection among VCT attendants in Arsi zone from 2002 to 2008 E.C.

The Analysis showed that the prevalence of HIV/AIDS showed dropout when compared 2002 E.C (2009/10 G.C). However, the rate of decline was not constant, it sharply decreased from 3.4% in 2002 E.C to 2.1% in 2003 and to 1.7% in 2004 but it slightly raised in the next years by 0.1%, i.e. in 2005 to 1.8%, in 2006 to 1.9% and slightly decreased in 2007 to 1.6% and the incidence raised above 2% in 2008. The global, regional and National reports also indicated that a decrease of the incidence of HIV/ infection. For example according a global report on HIV/AIDS by UNAIDS, there was large reduction the infection was observed in eastern and southern Africa(5). But in the study area prevalence is still high compared to the national findings as explained earlier.

As general there was a gradual decline of HIV infection, still there are disparities of the prevalence of HIV/AIDS among districts (health facilities), districts like Robe, Abomsa, Kersa, Dera, Assela, Eteya, Aseko, Huruta, Ziway dugda, Bokoj were considered as hot spot areas for the prevalence of HIV infection. According to report of UNAID 2016, globally the magnitude of HIV infection. showed a downfall, but there is country, regional differences(5).

Factors associated with HIV positive was assessed, accordingly in this study significant association was observed among marital status with HIV positivity. The risk of HIV infection was higher among formerly married (widowed/divorced/separated) (AOR = 2.43, 95%CI = 1.99, 2.98) compared to single. Though the strength of association is moderate, the likelihood of HIV positive was 1.43 times more likely among currently married and in union compared to unmarried ones (AOR = 1.43, 95%CI = 1.21, 1.70). Consistent with this study the study conducted in Nairobi Kenya reported that, this risk of HIV/AIDS was higher among widowed compared to unmarried(12–14). The attribute could be due to, the reason for their divorce and separation could be one of the partner might be affected by HIV infection or He she might have risky behavior. Whilst for widow, the cause for the death of the former partner could be related with HIV/AIDS.

Our study also showed that married individuals were at risk of getting HIV infection compared to unmarried(15). The justification for this association could be spouses are likely to enter into relationships without knowledge of each other's HIV status or with no interest to know their self and spouses HIV status even after marriage. In other context married individuals are less likely to use HIV prevention strategies

including condoms and HIV counseling and testing services, especially when one of the spouses is not faithful.

With regard to the effect gender on being HIV positive, in this study females were more likely to be HIV positive than their counterparts. This is in line with different studies conducted in Ethiopia (16, 17). Evidences reflecting that a range of factors contribute to the vulnerability of women to the HIV virus. Women are victims of discrimination in the economic, social and political life of the community which factors may directly or indirectly contribute to their exposure to HIV/ AIDS. Many of them are also subjected to different kinds of violence's including sexual violence, harmful traditional practices like female genital mutilations which increase their chance of HIV infection(18),nature of their reproductive biology that increase the retention of viruses in their body compared to men (19, 20).

Occupation showed that an association with the HIV positivity. A significantly strong association of HIV positive was observed among commercial sex workers.

The odds of acquiring HIV infection was more than 3 times more likely among prostitutes (AOR = 3.30, 95%CI = 1.52, 7.16). Similarly a study conducted in Uganda, reported that the prevalence of HIV AIDS was higher among Prostitutes(21). It is well understood that these group of population were more vulnerable for the infection due their nature of work, living by trading sex. There was also significantly association with daily workers and house wife; the risk of infection was two times higher among daily workers (AOR = 1.95, 95%CI = 1.52, 2.50) and 1.6 times higher among housewife (AOR = 1.62, 95%CI = 1.28,2.05).

Age has significant influence on the HIV infection, when we disaggregate the prevalence of HIV/AIDS among different age group, the odds of being infected by HIV/AIDS infection was higher among older people compared to younger age group. Participants found in age above 35 were more than 3 times more likely to get HIV/AIDS compared to younger age group, the AOR with 95% is as following (age 35–49, AOR = 3.17, 95%CI = 2.49,4.02); age 50–64,AOR = 3.35, 95%CI = 2.43,4.63); age > = 65,AOR = 3.20, 95%CI = 1.78,5.77). This finding is consistent with previous studies conducted at different areas including in our country, where older groups were positive for HIV infections(22, 23). The proposition of this finding that the longer survival of people living with HIV and the ageing of the HIV + population. This is also pointed as that people visit health facility (seek screening) when they suspect their selves as being infected if they were contacted sexually with person pass away and be panic for screening. Other than this, other this when their health is disturbed after the consequence of advanced stage of HIV/AIDS, after long stay with infections.

One of the limitations of this study was not including, PMTCT/ ANC data which is one of the three methods of data used for assessing trends of HIV/infection, due to pre assessment of uavailability of fully recorded registration and to avoid some overlapping as possible. The trend did not indicate by rural and urban due to no information available in the registrations. In some cases case may be retested, but we have tried to ignore those individuals tested previously from the registrations. So, considering this limitations it is better to cautiously interpret this findings. Though the study has its own strengths; use of a large sample laboratory-confirmed HIV serostatus records. It might be the first time in the study area as well as probably in the country and elsewhere as far as our knowledge.

Therefore, the finding from this study will be used to as a source of information to governmental and non-governmental policy makers to evaluate their programs.

## Conclusions

This analysis showed that the trend of HIV infection in Arsi zone showed a slight decreasing before 2016 and moderately increased in 2016 even though the VCT was not fully provided due to shortage of Kits for test at national level. The incidence of HIV was high among older group population compared to the younger. The changes in HIV prevalence were variable in some districts. Findings from logistic regression analysis indicated that demographic characteristics like, marital status, age and occupation significantly associated with HIV positive, after controlling the confounding effect.

Based on the finding of this study, there are is no encouraging indications that the HIV prevalence has decreasing since there was variation among districts. Therefore there is a need of designing strategy to combat the spread of HIV infections, so we have forwarded the following recommendation for Arsi university, Zonal health department and woreda health offices, Ministry of Health and other concerned stakeholders with HIV program and related to tackle or to make zero prevalence of this public health importance issue as follow;

- **For Ethiopian Federal Ministry of Health;**
- Working with partners to improve the uptake of VCT services at all level.
- Strengthening the VCT services properly with close follow up of the activities being done.
- Improvement of the HMIS VCT registration book to include other important socio-demographic characteristics like marital status, educational status occupational status and others which are important comparison variables.
- Monitoring the epidemics of HIV in accordance with subpopulation segmentation and localized intervention programs would have a vital importance rather than using the national prevalence as the key monitoring variable.
- More prevention campaigns should be intended and carried out while matters arising
- with increasing access to HIV testing, counseling, ART and care should be accessed.
- **UN and other Organizations** Re-strengthening their funding and technical support for developing country like Ethiopia to run the programs of HIV/AIDS service, including VCT service uptake improvement.
- Designing fingerprint identifier, to avoid some overlapping to determine the true incidence to avoid some social desirability bias and lies during incase of re-testing.

## List Of Acronyms

AIDS Acquired Immuno deficiency syndrome

ART Anti Retro Viral Treatment

CDC Center for disease prevention and control office

E.C Ethiopian Calendar

EDHS Ethiopian Demographic Health Survey

EPHI Ethiopian Public Health Institute

FMOH Federal Ministry of Health

G.C Gregorian Calendar

HIV Human Immunodeficiency syndrome

VCT Voluntary counseling and testing

UNAIDS The Joint United Nations program on AIDS

WHO World Health Organizations

## **Declarations**

### **Acknowledgement**

Our special thanks go to Arsi University for its limited financial support for the project activity during field work. It's our great pleasure to appreciate data collectors and data clerk for their precious time investment for this project. Finally we thank Woreda health offices and health facility leaders for their cooperation.

### **Authors' contributions**

MTS had substantial contribution; did conceptualization of the study, design, analysis and interpretation of the data as well as manuscript preparation. HF has made substantial contributions on the analysis and interpretation of data and participated in the critical review and editing of the manuscript drafts for scientific merit and depth. MA and HT have been involved in analysis, interpretation of data and revising it critically for important intellectual contents. All authors read and approved the final manuscript.

### **Funding**

Limited fund was obtained from Arsi University.

### **Availability of data and materials**

Additional detailed information and raw data will be shared upon request addressed to the corresponding author.

### **Ethics approval and consent to participate**

The required data were collected after obtaining ethical clearance from Arsi University College of Health Science Ethical Review Committee. In addition support of letter was written to Arsi Zone Health Office to get

permission then the zone wrote letter to respective districts to give support during data extraction.

## Consent for publication

The Author declares that contributed in this work are aware of the fact and have agreed to be named in the manuscript. The Authors guarantees that the Work has not been previously published elsewhere. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## Competing interests

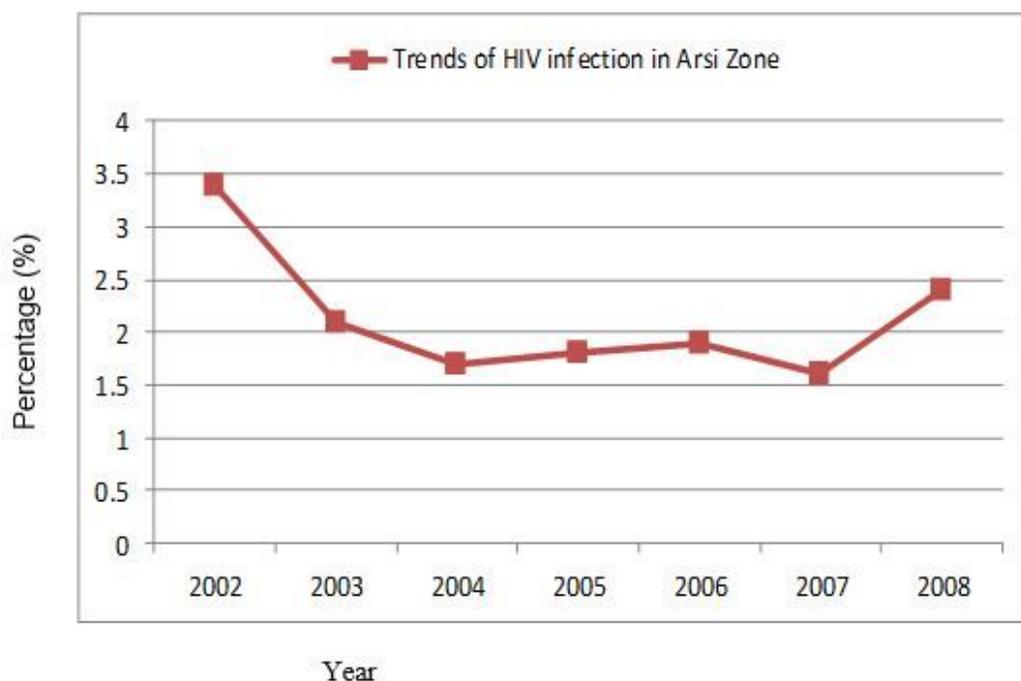
The authors declare that they have no competing interests.

## References

1. CDC. The Global HIV/AIDS pandemic. 2019.
2. UNAIDS. Global AIDS update 2019.
3. WHO. Fact Sheets On HIV/AIDS. 2019.
4. UNAIDS. Global HIV & AIDS statistics – 2019 fact sheet. 2019.
5. UNAIDS. Global AIDS update. 2016.
6. UN. Transforming Our World: The 2030 Agenda for Sustainable Development 2015.
7. Central Statistical Agency (CSA) [Ethiopia], Macro. al. Ethiopia Demographic and Health Survey 2011. Addis Ababa, Ethiopia, and Calverton, Maryland, USA: Central Statistical Agency and ICF Macro.; 2012.
8. Central Statistical Agency (CSA) [Ethiopia], Macro. al. 2012. Ethiopia Demographic and Health Survey 2015. Addis Ababa, Ethiopia, and Calverton, Maryland, USA: Central Statistical Agency and ICF Macro. 2016.
9. Cuadros DF, Awad SF, Abu-Raddad LJ. Mapping HIV clustering: a strategy for identifying populations at high risk of HIV infection in sub-Saharan Africa. . *Int J Health Geogr* 2013;12(28).
10. David AL. HIV/sexually transmitted infection epidemiology, management and control in the IUSTI Africa region: focus on sub-Saharan Africa *Sex Transm Infect.* 2011;87.
11. Chris Beyrer, Anna-Louise Crago, Linda-Gail Bekker e. An action agenda for HIV and sex worker. . *Lancet.* 2015;385(9964):287-301.
12. Brima N, Burns F, Fakoya I, Kargbo B, Conteh S, Copas A. Factors Associated with HIV Prevalence and HIV Testing in Sierra Leone: Findings from the 2008 Demographic Health Survey. *PLoS ONE* 2015;10(10).
13. Samson B.A, Richard I.O, Omokhudu I, Jennifer A, Augustine A. Marital Status and HIV Prevalence in Nigeria: Implications for Effective Prevention Programmes for Women. *Advances in Infectious Diseases.* 2013:210-21.
14. Oluch T.etal. Correlates of HIV Infection Among Sexually Active Adults in Kenya: A National Population-Based Survey *The Open AIDS Journal* 2011;5:125-34.

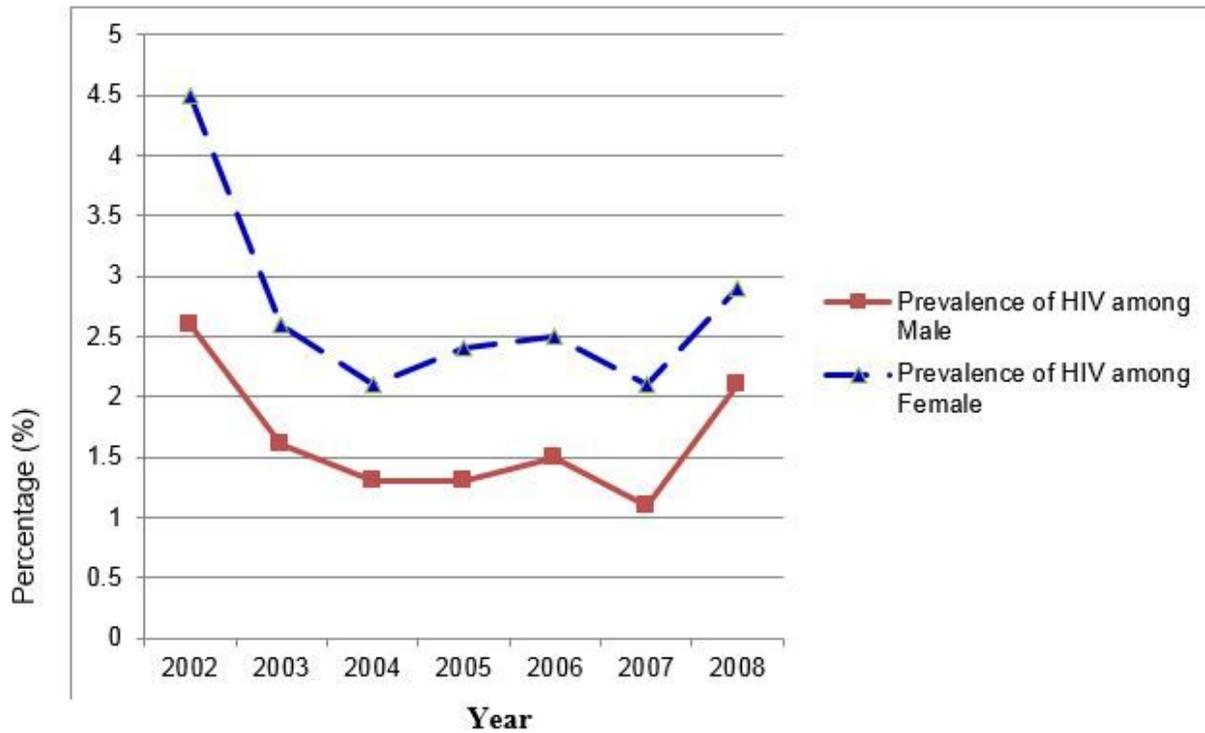
15. Mohamed BA, Mahfouz MS. Factors Associated with HIV/AIDS in Sudan. *BioMed Research International*. 2013;2013:1-6.
16. Rathavuth H, Vinod M, Pav G. Factors Associated with Prevalent HIV Infections among Ethiopian Adults: Further Analysis of the 2005 Ethiopia Demographic and Health Survey. Calverton, Maryland, USA: Macro International Inc. 2008.
17. Kibret G.D, Ferede A, Leshargie Ch.T, Wagnew F, Ketema D.K, Alebel A. Trends and spatial distributions of HIV prevalence in Ethiopia. *Infectious Diseases of Poverty*. 2019;8(90).
18. Merso F. Women and girls and HIV/AIDS in Ethiopia. 2017.
19. Gillespie S. Poverty, food insecurity, HIV vulnerability and the impacts of AIDS in sub-Saharan Africa. 2008.
20. Girum T, Wasie A, Lentiro K, Muktar E, Shumbej T, Difer M ea. Gender disparity in epidemiological trend of HIV/AIDS infection and treatment in Ethiopia. *Arch Public Health*. 2018;76(1):51.
21. John R. High HIV prevalence and associated factors in a remote community in the Rwenzori region of Western Uganda. . *Infectious Disease Reports* 2010; 2:e13. 2010.
22. Joel N, Robert G.C. HIV infection in older adults in sub-Saharan Africa: extrapolating prevalence from existing data *Bull World Health Organ*. 2010;88:847-53.
23. Lakew Y, Benedict S, Haile D. Social determinants of HIV infection, hotspot areas and subpopulation groups in Ethiopia: evidence from the National Demographic and Health Survey in 2011. *BMJ Open* 2015;5.

## Figures



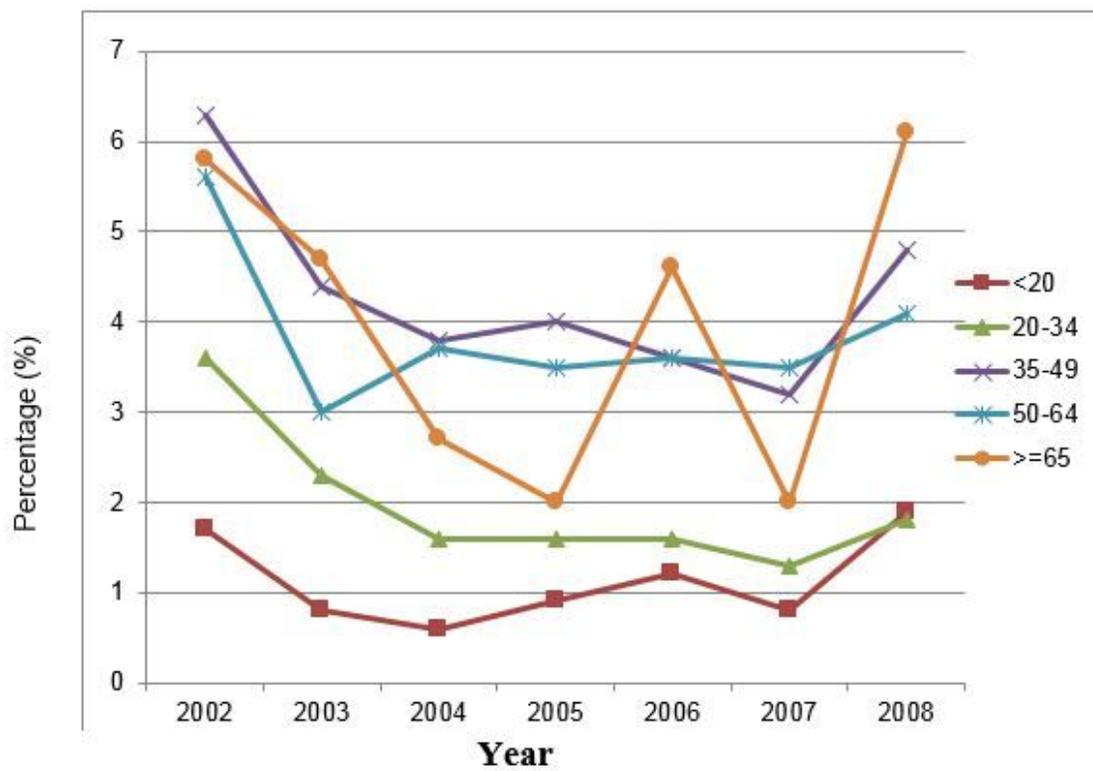
**Figure 1**

Trends of HIV infection among VCT attendants at Arsi Zone from 2002-2008 E.C (2010-2016)



**Figure 2**

Trends of HIV infection among VCT attendants by Sex at Arsi Zone from 2002 to 2008 E.C (2010-2016 G.C).



**Figure 3**

Trend of HIV/AIDS infection among Age groups at Arsi zone from 2002-2008 E.C (2010 to 2016 G.C)

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [FacilityspecificTrends supplementary.docx](#)