Original article

Prevalence of Human Immunodeficiency Virus infection and associated factors among students at Bahir Dar University

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Abstract

Introduction: The peak incidence of Human Immunodeficiency Virus (HIV) infection occurs among young people aged 15-24 years. University students are vulnerable to HIV because of their age, living arrangement and lack of family supervision. However, there is scarcity of data on prevalence of HIV infection among university students in different parts of Ethiopia.

Objective: This study was conducted to determine the prevalence and risk factors of HIV infection among regular undergraduate students at Bahir Dar University.

Methods: A cross- sectional study was conducted on 817 students in Bahir Dar University from January to March 2013. Self-administered questionnaire was used to collect data on socio-demographic variables and behavioral factors. Whole blood samples were tested for the presence of antibody to HIV infection using National HIV rapid diagnostic tests algorithm. Regression analysis was computed to identify the independent risk factors.

Results: Overall, the sero-prevalence of HIV was 10 (1.2%) (95%CI:0.7-2.24%) where four of them were females (1.5%). The point prevalence was 4 (2%) and 5 (6.9%) among third year students and students who begun sex at the age of 10-17 years, respectively. Having sex after alcohol drinking (AOR=8.7, CI=1.26-60) and *khat* chewing (AOR=8.2, CI=1.1-62), watching pornography (AOR=13.5, CI=1.56 -117) and inconsistent use of condom (P=0.02) were the risk factors for HIV infection.

Conclusions: The prevalence of HIV infection among Bahir Dar University students is high. New infection among young people suggested that the disease is not under control yet in the country. Therefore, planning strategy to prevent the spread of HIV infection at university is critical. [*Ethiop. J. Health Dev.* 2014;28(3):170-177]

Introduction

Although Human Immunodeficiency Virus (HIV) prevalence has shown a decline in recent years, the spread of HIV infection remains a major public health concern particularly in young people (1, 2, 3). HIV remains one of the major public health problems for developing countries (1, 2). Sub-Saharan Africa is the most seriously affected region (3).

According to many studies, the peak incidence of HIV infection occurs among young people aged 15 - 24 years (4, 5). For instance, globally more than half of all new HIV infections occur between 15 to 24-year-olds, and nearly 60,000 young people within this age group become infected daily with HIV (4).

Young people are particularly vulnerable to HIV infection because of the physical, psychological, social and economic attributes (3). Young adults are also at risk because of high risk sexual behaviours such as sexual practice with commercial sex workers and having multiple sexual partners (3, 6). Studies conducted in Ethiopia indicated that life styles and substance abuse such as drinking alcohol, chewing *khat* and watching pornography among university students places them at risk of contracting HIV (4, 6). Moreover, peer pressure to obtain luxury items, such as expensive clothing, jewellery, fashionable hairstyles, accessories, and makeup, motivates young women to engage in transactional sex (3, 6, 7).

Ethiopia is one of the sub-Saharan African countries severely affected by the HIV/AIDS pandemic where approximately, 1.2 million people are living with HIV/AIDS (8). According to the 2013 National Demographic and Health Survey, the adult HIV prevalence rate was 1.3% with 0.9% and 1.7% among males and females, respectively (9). It is also estimated that 2.9% of young people ranging from 15-24 years of age are infected with HIV (10). High prevalence of HIV infection has been also reported from schools (4, 5).

Risky sexual practices and gaps in knowledge and attitude towards HIV/AIDS prevention and control have been documented in studies conducted among higher education students in Ethiopia (10, 11-13). However, Ethiopia's Ministry of Education, in its strategy, recommends the collection of up-to-date data on HIV/AIDs challenges in higher education institutions (HEIs) and the country at large. Therefore, this cross-sectional study was carried out to determine the prevalence of HIV and associated factors among regular undergraduate students at Bahir Dar University.

Methods

Study Design, Period and Setting:

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A cross-sectional study was conducted from January to February 2013 among regular undergraduate students at Bahir Dar University. Bahir Dar University is located in Bahir Dar city which is the capital of Amhara National Regional State (ANRS) (14). Because of Lake Tana and its Monasteries, Bahir Dar city is a tourist attraction area. It has also many pensions and night clubs (15). Bahir Dar University is one of the largest universities in the Federal Democratic Republic of Ethiopia, with more than 35,000 students in its undergraduate and graduate programs. Currently, it has four campuses with four colleges, three institutes, three faculties and one school (16).

Sample Size and Sampling Techniques:
To calculate sample size, HIV infection proportion (0.5), 95% level of confidence, 5% margin of error, 2% design effect and 13% non-response rate were considered. Using single population proportion formula ($N = z\alpha/2\ p\ (1-p)/d2$), a total of 817 sample size was determined and made to participate in the study. Multistage stratified simple random sampling technique was used. All the seven colleges/ faculties of Bahir Dar University were included and participants were allocated proportionally to each college size. The number of departments of each College was matched proportionally to their student size. Departments from each college were selected randomly. The sample size allocated to each college and distributed to each randomly selected department was proportional to their respective student numbers. Male to female ratio and year of study were also kept proportional to student size. Students were chosen randomly from the selected departments.

Inclusion and exclusion criteria: Regular undergraduate students ranging from years I to V were included in the study whereas postgraduate, extension, summer, advance standing and distance learning students were excluded from the study.

Operational Definitions:
Consistent condom use**:** Using condom during each and every sexual intercourse.

Off-campus habitation**:** Receiving money allocated for dormitory service and living outside of the university compound.

Data Collection:
Socio-demographic variables and behavioral factors such as age at first sexual intercourse, sexual relationship with multiple sexual partners, watching pornography, having sex after alcohol drinking, *khat* chewing, frequenting nightclubs, condom use, sex in exchange for money and sex with commercial sex workers were collected using a structured questionnaire. The above variables were completed in the questionnaire by students themselves in order to increase participation and honest responses.
HIV Infection Screening:
Capillary blood was collected using sterile lancet from each study participant after thoroughly cleaning fingertips with 70% alcohol swabs. Then, the first drop of blood was wiped away and the remaining blood drops were collected using capillary tubes. Antibody to HIV infection was tested using the national HIV rapid diagnostic tests algorithm. Initially, HIV infection was screened using KHB (Bio-Engineering, Shanghai, Kehua). HIV positive samples were re-tested with STAT PAK (Chembio diagnostic, INC, Medfold, Newyork). HIV positive samples yielding discordant results between the first and the second tests were tested again with Unigold (Trinity Biotech PLC, Bray, Ireland). The results were interpreted using the current national algorithm for screening of HIV infection from whole blood which was adopted from WHO.

Statistical Analysis:
Data were analyzed using SPSS Version 20 statistical software. Bivariate analysis and fisher's exact test was used to see the association between dependent and independent variables. To determine independent predictors of HIV infection, multivariable logistic regression analysis was employed by taking variables whose *p*-value was ≤ 0.21 in the binary logistic regression model. *P*-value of < 0.05 was considered statistically significant.

Ethical Considerations:
Ethical clearance was obtained from the research and Ethical Review Committee of College of Medicine and Health Sciences at Bahir Dar University. A statement about the purpose of the study was read to each study participant, and those who gave written consent to participate in the study were also included. The result of HIV test was communicated to the study participants after provision of post-test counseling. Confidentiality of the result was also maintained with anonymity and not used for other purposes. HIV positive students were referred to HIV/AIDS coordinating office of the university to get HIV counseling, treatment, HIV case and support services.

Results
Characteristics of Study Participants:
A total of 817 regular first degree students with median ages of 21 years with inter-quartile range of 20-22 years participated in the study. Similarly, the median study year of participants was year II with inter-quartile range of year I to III. Most (84.6%) of the students were unmarried, 624 (76.4%) were Orthodox Christianity followers, 802 (98.2%) used to live in campus dormitory; 13 (4.4%) did not receive any financial support (Table1).

HIV Prevalence:
The prevalence of HIV infection among all the students was 1.2% (95% CI: 0.7-2.24) (10 students found sero-positive), while the prevalence among female students was 1.5% (4 female students found sero-positive). The

highest prevalence of HIV infection was detected among year III students 4 (2%) followed by year I students 4 (1.6%) (Table1). HIV infection distribution in age groups is illustrated in Table 1.

Living off-campus minimizes the chance of becoming HIV positive as compared with living on campus (0% vs 1.2%). Proportion of HIV infection was lower among students who got financial support from their family members than those who received it from other sources. Overall, prevalence of HIV infection was varied by the age at which students practiced first sexual intercourse. Prevalence of HIV was higher in students who had early (10-17) years of age sexual practice than their counter parts (Table 1).

Of the 16 (5.4%) students who had sexual intercourse with teachers, 4 were HIV positive and from 12 students who practiced sex to earn money, 2 were HIV positive. Moreover, high levels of HIV infection were found among study participants who had sex with commercial sex workers (Table 2).

Multivariate analysis*:* In terms of multivariate analysis, HIV infection was significantly associated with participants having sex after drinking alcohol (AOR= 8.7, CI=1.26 - 60) and chewing *khat* (AOR=8.16, CI=1.07-62). Participants who had sex after drinking alcohol were 8.7 times more likely to become HIV positive compared to participants who did not have sex after drinking alcohol. Likewise, participants who practiced sex after chewing *khat* were 8.2 times more likely to have HIV infection compared to those who had no such practice. Participants who watched pornography were 13.5 times more likely to become HIV positive as compared to their counterparts (AOR=13.5, 95% CI=1.56-117) (Table 3). Having sex with teachers was about 13 times more likely to be a risk factor for HIV infection (AOR=12.9, 95% CI=2.44–68.5) (Table 3). Based on fisher's exact test, inconsistent use of condom had statistically significant association for HIV infection (P=0.02) (Table 2). Having multiple sexual partners (AOR=2.96, 95% CI=0.1-87), frequenting nightclubs (AOR = 0.52, 95% CI =0.07-3.87), having sex in return for money (AOR = 0.67, 95% CI=0.05-9.2) and having sex with commercial sex workers (AOR = 1.1, 95% CI=0.1-12.3) were some of the insignificant variables of HIV infection (Table 3).

Table 1: **Prevalence of HIV infection and demographic characteristics among regular undergraduate students at Bahir Dar University 2013**

Variables	HIV sero-status			COR (95% CI)	P value
	Positive N (%)	Negative N (%)	Total N (%)		
Sex of participant					
Male	6 (1.1)	539 (98.9)	545 (66.7)	1	0.74
Female	4 (1.5)	268 (98.5)	272 (33.3)	0.75 (0.21 - 2.67)	
Age in year					
18-19	1 (0.6)	165 (99.4)	166 (20.3)	1	
20-24	8 (1.3)	610 (98.7)	618 (75.6)	2.4 (0.29 - 19.6)	0.42
>24	1 (3)	32 (97)	33 (4)	5.1 (0.3 - 84.6)	0.25
Religion					
Orthodox	7 (1.1)	617 (98.9)	624 (76.4)	NA	
Protestant	2 (2.2)	88 (97.8)	90 (11)		0.47**
Muslim	0 (0)	82 (100)	82 (10)		
Catholic	0 (0)	8 (100)	8 (0.9)		
Other*	1 (7.7)	12 (92.3)	13 (1.6)		
Marital status					
Unmarried	6 (2.5)	235 (99.1)	241 (86.2)	1	
Married	2 (4.3)	45 (98.1)	47 (12.4)	6.4 (0.78 - 53)	0.09
Divorced/Widowed	2 (22)	7 (71.4)	9 (0.8)	11.1 (1.9 - 65.6)	0.007
Year of study					
First year	4 (1.6)	250 (97.7)	254 (31.1)	NA	
Second year	2 (0.78)	254 (99.2)	256 (31.3)		
Third year	4 (2.0)	193 (97.9)	197 (24.1)		
Fourth year	0	65 (100)	65 (7.9)		
Fifth year	0	45 (45)	45 (5.5)		
Place of residence					
On-campus dormitory	10 (1.2)	792 (98.8)	802 (98.2)	1.1 (1.00 -1.03)	1.00
Off-campus habitation	0	15 (100)	15 (1.8)	1	
Financial sources					
Family members	8 (1.0)	257 (99)	265 (89.2)	NA	0.12
Other relatives	0	19 (100)	19 (6.4)		
No support	2 (8)	11(84.6)	13 (4.4)		
Age of first sexual intercourse					
10-17 years	5(6.9)	67(93.1)	72(24.2)	6.5 (0.74 - 57)	0.09
18-19 years	4(2.9)	132(97.1)	136(45.8)	2.5 (0.65 - 9.6)	0.19
≥20 year	1(1.1)	88(98.9)	89(30)	1	
Total	**10 (1.2)**	**811 (98.8)**	**817 (100)**		

Key: COR (Crude odds ratio), CI (Confidence interval), NA (Not applicable) ** Fisher's exact test, [1]: Reference category

Table 2: **HIV prevalence and associated factors among regular undergraduate students at Bahir Dar University, 2013.**

Variables	V sero-status			COR (95% CI)	*P value*
	Positive	Negative	Total		
	N (%)	N (%)	N (%)		
Ever had multiple sexual partner					
Yes	8 (6.3)	118 (93.7)	126 (42.4)	5.66 (1.18 - 27)	0.03
No	2 (1.2)	169 (98.8)	171 (57.3)	1	
Ever watched pornography					
Yes	5 (7.1)	52 (92.9)	56 (18.9)	0.3 (0.09 -1.2)	0.09
No	4 (2.5)	235 (97.5)	241 (81.1)	1	
Had sex after watching pornography					
Yes	4 (5.6)	67 (94.4)	71 (23.9)	2.3 (0.62-8.3) *	0.21
No	6 (2.7)	220 (97.3)	226 (76.1)	1	
Alcoholism					
Non-drinker	2 (1.8)	107 (98.2)	109 (36.7)	1	
Occasional drinker	6 (3.4)	170 (96.6)	176 (59.3)	0.53 (0.1 - 2.7)	0.44
Frequent drinker	2 (16.7)	10 (83.3)	12 (4.0)	0.09 (0.01 - 0.74)	0.02
Had sex after alcohol intake					
Yes	8 (8)	92 (92)	100 (33.7)	8.5 (1.76-40.7)	0.008
No	2 (1)	195 (98.9)	197 (66.3)	1	
Had sex after chewing *khat*					
Yes	5 (11.1)	40 (90.2)	45 (6.2)	0.16 (0.05-0.59)	0.005
No	5 (1.98)	247 (99.3)	252 (93.8)	1	
Frequenting nightclub					
Yes	6 (5.4)	103 (96.1)	109 (15.8)	2.7 (0.74 - 9.7)	0.13
No	4 (2.1)	184 (99.3)	188 (84.2)	1	
Frequency of condom use					
Never used	4 (4.3)	90 (95.7)	94 (31.6)	NA	0.02**
Sometimes	0 (0)	18 (100)	18 (6.1)		
Most of the time	6 (7)	80 (93)	86 (29)		
Always	0	99 (100)	99 (33.3)		
Had sex to earn money					
Yes	2 (16.7)	10 (83.3)	12 (4)	7.05 (1.32 - 37.6)	0.02
No	8 (2.8)	277 (97.2)	285 (96)	1	
Had sex with commercial sex workers (N=296)					
Yes	2 (9.1)	20 (90.9)	22 (7.4)	0.1 (0.02 -0.54)	0.006
No	8 (2.9)	266 (97.1)	274 (92.6)	1	
Had sex with teachers (N=296)					
Yes	4 (23.5)	12 (70.6)	16 (7.7)	15.2(3.79 - 61.2)	<0.001
No	6 (2.1)	274 (97.9)	280 (94.3)	1	
Total	**10 (1.2)**	**807 (98.8)**	**817 (100)**		

Key: COR (Crude Odds Ratio); NA (Not applicable), ** Fisher's exact test, [1]**:** Reference category

Table. 3: **Multivariate analysis showing the risk factors of HIV prevalence among regular undergraduate Bahir Dar University students, 2013.**

Variables	COR 95% CI	*P*-value	AOR (95% CI)	*P*-value
Marital status				
Single	1		1	
Married	12.4 (0.47 -11.8)	0.01	0.1 (0.008 -2.23)	0.16
Divorced	0.05 (0.1- 4.41)		0.84 (0.12 - 6.19)	0.87
Age of first sex				
10-17	2.4 (0.26 - 19.6)	0.42	2.68 (0.15 - 48.9)	0.51
18-19	5.1 (0.3 - 84.6)	0.25	1.99 (0.38 -10.5)	0.42
≥20	1		1	
Ever had multiple sexual partner				
Yes	0.18 (0.04 -0.85)	0.03	2.96 (0.10 - 87.4)	0.53
No	1		1	
Frequenting nightclubs				
Yes	0.12 (0.03 - 0.42)	0.001	0.52 (0.07-3.87) 1	0.52
No	1		1	
Frequency of condom use				
Never used	NA	0.02	NA	0.02**
Sometimes				
Most of the time				
Always				
Had sex to earn money				
Yes	7.05 (1.32 - 37.6)	0.02	0.67 (0.05- 9.2)	0.77
No	1		1	
Alcoholism				
Non-drinker	1		1	
Occasional drinker	10.07 (0.01 - 0.50)	0.03	0.1 (0.01 - 0.91)	0.24
Frequent drinker	0.2 (0.04 - 1.10)		0.3 (0.01 -4.1)	
Had sex after alcohol intake				
Yes	12 (3.87 - 37.7)[1]	0.000	8.7 (1.26 - 6.0)	0.03
No	1		1	
Had sex after chewing *khat*				
Yes	16.5 (4.62 - 59.2)	0.00	8.2 (1.1 -62)	0.046
No	1		1	
Had sex with teachers				
Yes	16.5 (4.62 - 59.2)	0.00	12.9 (2.44 - 68.5)	0.003
No	1		1	
Watching pornography				
Yes	3.0 (0.82 - 11.1)	0.09	13.5 (1.56 – 117)	0.02
No	1		1	
Had sex with commercial sex workers				
Yes	0.1 (0.02 - 0.54)	0.006	1.1 (0.10 - 12.3)	0.93
No	1		1	
Had sex after watching pornography				
Yes	2.3 (0.62-8.3)	0.21	2.2 (0.36 - 13.4)	0.39
No	1		1	

Key: AOR (Adjusted Odds Ratio), **NA** (Not applicable), **COR (**crude odds ratio), **CI (**Confidence interval), ** Fishers exact test,
1 Reference category

Discussion

HIV infection is a significant public health problem particularly in developing countries, including Ethiopia. The overall prevalence of HIV infection among university students (1.2%) in the present study is high. Moreover, the prevalence of HIV infection was higher among females than males. Therefore, HIV infection is a major threat to the generation. The high prevalence of HIV infection might be associated with life styles and risky sexual practice such as sex with commercial sex workers and inconsistent use of condom. Moreover, the presence of tourists, nightclubs and pensions in the study area (15) might have encouraged transactional sex and sexual relationship with partners outside the university environment which might in turn have led to the existence of high rate of HIV infection. In this study, having sex after drinking alcohol and chat chewing, watching pornography and inconsistent use of condom were found to be significantly associated with HIV infection.

The prevalence of HIV infection in this study conforms to the current national adult HIV prevalence (1.3%) (9). Moreover, the prevalence was lower than one reported by studies carried out in Dire Dawa University, Ethiopia (5) and other African countries (17-19) that revealed 1.8% to 3.4 % HIV prevalence among university students. However, our findings are higher than the 0.95% and 0.2% HIV prevalence reported in Southern Nigeria (20) and USA (21), respectively. The possible explanation for this difference could be due to difference in socio-cultural situations among countries, students' living arrangement among universities and degree of students' awareness about HIV transmission.

In this study, the prevalence of HIV infection was higher in females. This finding was consistent with the expected national prevalence (9) and reports from the Centers for Disease Control and Prevention (22), which noted that young women residing in developing countries are more susceptible to HIV infection. The finding was also in agreement with previous studies conducted in other parts of Ethiopia (23, 24), and Africa (25, 26). The higher prevalence of HIV infection among female students might be due to greater risks to factors such as early sexual debut, early marriage, sexual abuse, violence and transactional sex (11). Moreover, females' sexual relationship and networking with men outside the university environment to meet their financial needs and pressure to obtain comfortable items such as expensive clothing, jewelry and make-up, might be the contributing factors (3). Furthermore, biological factors including immature genital tract, male to female HIV transmission and lack of comprehensive knowledge about HIV/AIDS, poor access to health services could also explain this difference (9, 27).

The current result confirmed that having early age sexual practice was associated with increased likelihood of being infected with HIV. This conforms to a report in rural Zimbabwe (28). This might be associated with the assertion that young students aged 15 - 24 years who engage in early sexual relationships are likely to have more sex partners and a possibility of engaging in unsafe sex which predisposes them to HIV.

In the present study, relatively high rate of HIV infection was observed among divorced and married students compared to unmarried. This might be due to low frequency of condom use within marriage and also the high frequency of extramarital sex among men, which suggests that a substantial proportion of married students would be exposed to HIV infection from their HIV infected spouse as it was explained in Zimbabwe by Kemb (26). In addition, marriage at a younger age and the transition from virginity to frequent unprotected sex is likely to lead to frequent engagement in sex even after the termination of marriage.

In this study, sexual intercourse after drinking alcohol, chewing *khat* and watching pornography were the predictor variables for HIV infection. Similar studies reported that substance abuse causes loss of inhibition and involvement in risky sexual behaviours such as unprotected sex, multiple sexual partners, prolonged and traumatic sex (12). In addition, different scholars also stated the above factors are the common factors that lead young people to exhibit risky sexual behaviours (8, 11-13, 29, 30).

Conclusions:

As the confidence intervals for some of the estimates are wide, caution needs to be taken in the interpretation of those findings.

Overall, according to the study, the prevalence of HIV infection among Bahir Dar University students is high. High risk behaviours such as having sex after drinking alcohol and chewing *khat*, watching pornography and inconsistent use of condom were the factors associated with HIV infection. New infection among young people suggested that the disease is not under control in the country yet.

Therefore, planning strategy to prevent the spread of HIV infection at universities is critical.

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References

1. Kaijaleena S, Yliopisto O. University students' attitudes towards HIV/AIDS in Finland and in Kenya. *Acta Univ Oulvensis* 2008; 995: 156 - 164.
2. United Nations Programme On HIV/AIDS. Global AIDS Epidemic. Geneva; UNAIDS, 2006: 3-10.
3. Oppong AK, Oti-Boadi M. HIV/AIDS knowledge among undergraduate university students: implications for health education programs in Ghana. *Afr Health Sci* 2013; 13 (2): 270 - 277.
4. Andargie G, Kassu F, Moges F. Low prevalence of HIV infection, and knowledge, attitude and practice on HIV/AIDS among high school students in Gondar, Northwest Ethiopia. *Ethiop J Health Dev* 2007; 21:179-182.
5. Mengistu B. HIV prevalence and associated factors among university students of Dire Dawa University, eastern Ethiopia. *Sex Transm Infect* 2013; 89: A243.Doi:10.1136/sextrans-2013-051184.0758.
6. Samuel L, Angamo MT. Substance use and sexual risk behaviour and factors associated with HIV transmission in southern Ethiopia. *IJPSR*, 2012; 3(4): 1080-1086.
7. Ankomah A. Condom use in sexual exchange relationships among young single adults in Ghana. *AIDS Educ Prev* 1998; 10: 303-316.
8. Regassa N, Kedir S. Attitudes and practices on HIV preventions among students of higher education institutions in Ethiopia: The case of Addis Ababa University. *Educ Res* 2011; 2: 2141 - 5161.
9. Federal Ministry Of Health (FMOH): Country Progress Report On HIV/AIDS Response. Addis Ababa, Ethiopia: National HIV/AIDS Prevention and Control office; 2012.
10. Mengistu TS, Melku AT, Bedada ND. Risks for STIs/HIV infection among Madawalabu University students, Southeast Ethiopia: a cross sectional study. *Reprod Health* 2011; 10**:** 4 - 7.
11. Malaju MT, Asale GA. Association of Khat and alcohol use with HIV infection and age at first sexual initiation among youths visiting HIV testing and counselling centers in Gamo-Gofa Zone, South West Ethiopia. *BMC Int Health Hum Rights* 2013; 13: 2 - 8.
12. Tura G, Alemseged F, Dejene S. Risky sexual behavior and predisposing factors among students of Jima University Ethiopia. *Ethiop J health Sci* 2012; 22: 170 - 80.
13. Gelibo T, Belachew T, Tiahun T. Predictors of sexual abstinence among Wolaita Sodo University Students, South Ethiopia. *Reprod Health* 2013*;*10:2-6.
14. Federal democratic Republic of Ethiopia population census commission: summary and statistical report of the 2007 population and housing census: population size by age and sex. Addis Ababa: Central statistics agency; 2011.
15. Tewabe T, Destaw B, Admassu M, Abera B. Assessment of factors associated with voluntary counselling and testing uptake among students in Bahir Dar university a case control study. *Ethiop J Health Dev* 2012; 26 : 17- 21.
16. Bahir Dar University background information [cited 10 July 2013]; Available at: URL:www.bdu.edu.et/background.
17. Beer IH, Gelderblom HC, Schellkins O, Gaeb E, van Roy G, McNally A, et al. University students and HIV in Nambia. An HIV prevalence survey and a knowledge and attitude survey. *J Int AIDS Soc*. 2012; 15:9.
18. Dell S. South Africa: Less HIV in universities than nationally. *Global window on higher education* 2013; 15: 130-1138.
19. White HL, Kristensen S, Coulibaly DM. Prevalence and predictors of HIV infection amongst Malian students. *AIDS Care* 2009; 21: 701-707.
20. Nwachukwu NC, Oril A. Sero-prevalence of human immunodeficiency virus among some fresh Nigerian graduates. *Res J Immunol* 2008; 1: 51-55.
21. Gayle HD, Keeling RP, Tunon MG. Prevalence of HIV among university students. *N Eng J Med* 1990;323:1538-1541.
22. Centers for Disease Control and Prevention (CDC). HIV Surveillance*:* Atlanta*;* CDC, 2009
23. Korra A, Bejiga M, Tesfaye S. Socio-demographic profile and prevalence of HIV infection among VCT clients in Addis Ababa. *Ethiop J Health Dev* 2005; 19: 109-115.
24. Biadgeglign F, Belyhun Y, Tessema B. Sero-prevalence of HIV among VCT clients in Burie health center, West Gojjam, Ethiopia. *Ethiop Med J* 2010; 48: 149 - 56.
25. Chipeta J, Schouten E, Aberle-Grasse J. HIV prevalence and associated factors. 2004; 225 – 241 [cited 2014]; Available at: URL:http://www.dhsprogram.com/pubs/pdf.
26. Kembo J. Risk factors associated with HIV infection among young persons aged 15-24 years. Evidence from an in-depth analysis of the 2005-06 Zimbabwe Demographic and Health survey. *SAHARA J* 2012; 9(2): 54-63.
27. Muula AG. HIV infection and AIDS among young women in South Africa. *Croat Med J* 2008; 49: 423 - 435.
28. Hallet TB, Lewis JJ, Lopman BA. Age of first sex and HIV infection in rural Zimbabawe. *Stud Fam Plann* 2007; 38: 1- 10.
29. CSA and ORC Macro. Demographic and Health survey: 2006 Report. Central Statistical Authority and ORC Macro, 2006.
30. Seloilwe E, Jack A, Letshabo K. HIV/AIDS at the University of Botswana: behavioural and prevention issues. *Botswana J Afri Stud* 2001; 15: 204- 210.