

Assessment of Risk Behaviors and Factors Associated with Oral and Peri-oral Lesions in Adult HIV Patients at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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Abstract

Background: HIV patients have several habits that can produce oral lesions. However, the association of oral habits and risk behaviors with oral and peri-oral lesions in HIV patients has not been studied in Ethiopia to date.

Objective: To assess the relationship of oral and peri-oral lesions with oral habits, risk behaviors, socio-demographic factors and clinical stages of disease among HIV infected adult Ethiopians.

Methodology

A cross-sectional study was conducted on consecutive adult ART naïve HIV patients at ART clinic of Tikur Anbessa Specialized University Hospital, Addis Ababa, Ethiopia during December 2005 to July 2006. The EC-clearing house's classification and diagnostic criteria for oral lesions in HIV infection was used. Written informed consent was obtained before enrollment to the study.

Results

A total of 384 patients, 126 (33%) males and 258 (67%) females were evaluated. The mean \pm SD age of males was 39.9 ± 10.56 , and females was 33.17 ± 8.85 years. Fifty seven (15%) of the unit of analysis were smokers, 178 (46%) alcohol consumers and 217 (57.1%) khat chewers, use tooth sticks for dental cleaning. Of which, 132 (34.7%) clean their teeth at least once a day and 302 (79%) gave history of recent significant weight loss. Linear regression analysis showed association of oral and peri-oral lesions with less frequent cleaning ($p=0.038$, $p=0.03$, respectively), means of cleaning ($p=0.004$; $p=0.001$), broad-spectrum antibiotic use ($p=0.019$, $p=0.008$), advanced stage of HIV ($p=0.016$, $p=0.001$) and CD4 level below 200 Cells/mm³ ($p=0.001$, $p=0.01$). The oral lesions were seen more frequently among smokers ($p=0.028$), heavy alcohol consumers ($p=0.041$), those with age above 40 years ($p=0.016$) and recent weight loss ($p=0.001$). At the level of binary logistic regression analysis smoking ($p=0.005$), CD4 count less than 200 ($p=0.039$) and stage 3 ($p=0.022$) and stage 4 disease ($p=0.046$) were found to be independent risks while daily dental cleaning habit was found to be protective ($p=0.021$).

Conclusion

Oral and peri-oral diseases among HIV/AIDS patients and are significantly associated with correctable risk factors like smoking and poor oral cleaning habits. Lesions are also frequent with evidence of advanced HIV disease and low CD4 count. These findings demonstrate the need for oral health examination and education to improve on risk behaviors and oral care in HIV/AIDS patients. [*Ethiop.J.Health Dev.* 2008;22(2):180-186]

Background

Opportunistic conditions and infections are the main causes of morbidity and mortality in patients infected with HIV (1, 2, 3). The pattern of opportunistic conditions and the outcome are different in different population. Several factors are responsible for these situations. In the developing world, low socio-economic status, literacy, access to health services and the availability of treatment affect the pattern of oral and peri-oral lesions. Behavioral factors related to the patients are also important determinants (4, 5). Oral health is part of total health and essential for quality of life. The ubiquity of oral HIV lesions emphasizes its clinical importance. In many developing countries access to oral health care is limited. The dentist to population ratio in Africa is about 1:150,000 (6, 7) and in Ethiopia is 1:1,400,000 (8).

are scarce; diagnosis, management, risk factor identification that impact on presenting oral and peri-oral manifestations is crucial (5, 9). In addition to socio-economic status, literacy and access to available health services, there are additional factors determining oral manifestations and outcomes. Infections and malnutrition influence mucosal integrity and contribute to poor oral hygiene and lesions. This will manifest in a form of angular cheilitis, periodontal disease, dental caries and oral candidiasis. Malnutrition is also associated with hypofunction of the salivary glands leading to xerostomia and loss of protection of the mucosa from various infections. Therefore, indicators of advanced HIV disease like weight loss, anemia, CD4 depletion and clinical stage also predict oral and peri-oral lesions (5, 9, 10).

A direct relationship between cigarette smoking and oral lesions was reported previously (11). However, another

In this situation where HIV infection is rife and resources

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study found no relationship between current smoking and presence of any oral disease (12).

The effect of medications like anti-fungal or anti-viral agents on the prevalence of oral diseases has been documented (13). Oral lesions were also found to be significantly associated with low CD4 counts below 300 cells/mm³ among Italian patients as reported by Moniaci et al 1990 (14).

Oral manifestations of HIV are widely studied in developed countries (15, 16, 17). Epidemiological reports are also increasing from African countries (5, 7, 10, 12, 23) However, there are no studies regarding HIV, risk behaviors and habits on oral and peri-oral diseases among Ethiopian patients to the best of our knowledge. The current study assessed the relationship of oral habits and risk factors to oral and peri-oral lesions, socio-demographic factors, and stage of HIV disease among Ethiopian patients presenting to a University referral Hospital ART clinic in Addis Ababa.

Methods

A cross-sectional descriptive study was conducted at the ART clinic of Tikur Anbessa Specialized Hospital, a teaching and tertiary referral hospital in Addis Ababa, Ethiopia, from December 2005 to July 2006.

Consecutive HIV infected adult patients who consented to volunteer and who had not started antiretroviral therapy were included. Those who could not give consent or had already started on ART were excluded from the study.

Data collection was done using a structured questionnaire assessing socio-demography, oral habits and risk behaviors. Physical examinations were done by Internal Medicine residents supervised by a stomatologist/dental surgeon and two internal medicine consultants. Laboratory data, hematologic profile and CD4 count were documented.

The presence of mucosal disease associated with HIV infection was recorded for each participant using the presumptive diagnostic criteria devised by the US collaborative group (18). Diagnoses were made on the basis of clinical appearance. The EC-clearing house's classification and diagnostic criteria for oral lesions in HIV infection (EC-clearing house on oral problems related to HIV infection and WHO collaborating centre on oral manifestations of HIV, 1992) (18) was used in the study and lesions classified as oral or peri-oral depending on the site of the lesion. World Health Organization classification system for HIV infection in adults and adolescents was used for staging of HIV (3).

Data were entered, and analyzed using SPSS version 12.0. Frequencies and percentages were calculated for all

variables. Chi-square tests were done as deemed necessary. A P-value of less than 0.05 was considered statistically significant; 95% confidence interval and odds ratio were calculated for comparison of data. Backward regression and likelihood ratio of binary logistic regression analysis were done for variables showing association to avoid confounding.

The lesions were classified as follows based on the EC-clearing house's classification (18).

- *Pseudomembraneous candidiasis, Erythematous candidiasis, Oral hairy leukoplakia, Aphthous ulcer, Cytomegalovirus infection, Linear gingival erythema, Necrotizing ulcerative gingivitis, Necrotizing ulcerative periodontitis, oral mucosal Kaposi's sarcoma, Sicca syndrome and dental caries were classified under oral lesions*
- *Herpes labialis, Angular cheilitis, Varicella zoster virus infection, Salivary gland enlargement/disease and molluscum contagiosum were classified under perioral lesions.*
- *Alcohol consumption - drinking habit of more than 2 pints or equivalent alcohol for more than two days a week for more than a year (19).*
- *Pack-years of smoking - the number of years equivalent to smoking 20 cigarettes per day each days of the year.*

The study obtained ethical clearance from the Faculty Research and Publication Committee (FRPC) of the Faculty of Medicine, Addis Ababa University. Written informed consent was obtained from study participants before enrollment in the study. The Data collection, analysis and reporting processes maintained strict privacy and confidentiality. The patients were provided with all the necessary treatments according to the national guidelines; and complementary oral medical care and health education.

Results

A total of 384 patients with HIV were assessed for oral and peri-oral lesions and risk behavior, oral habit and disease progression. Females accounted for 258 (67.2%) with mean age of 33.2 ± 8.9 years and males were 126 (32.8%) with mean age of 39.9 ± 10.6 years. A quarter of the study subjects 97 (25.2%) had no formal education and 128 (33.3%) completed primary school. Most of them 210 (54.7%) were dependents without their own income, 68 (17.7%) housewives, 66 (17.2%) unemployed and 32 (8.3%) daily laborers. Forty five (11.7%) were government employees and 42 (10.9%) were private employees.

The average weight was found to be 50.7 ± 9.3 Kg. More than 10% weight loss was observed among 170 (44.3%) of the patients in the last 6 months. Stage four disease was diagnosed in 107 (27.9%) of the patients, 176

(45.8%) were in stage three; the others were in stage one and two (7% and 19.3% respectively). Among 384 patients CD4 count was below 200 in 250 (65.1%) and hematocrit was below 30% in 52 of 284 subjects (18.3%). Different forms of oral lesions were seen among 247 (64.3%) and peri-oral lesions in 59 (15.4%) of the patients.

As shown in Table 1, almost all the study subjects, 380 (99%), cleaned their teeth. Most of them, 217 (57.1%) used chewing sticks. Tooth paste use was observed in 107 (28.2%) participants. Fifty six (14.6%) used only rinsing water after meals. A significant number of patients 118 (30.7%) cleaned their teeth less frequently than weekly. Only 132 (34.7%) cleaned their teeth at least once per day. Fifty seven (14.8%) of the patients were smokers. Although 178 (46.4%) drink variable amounts of alcohol, 52 (13.5%) consumed more than two units of alcohol per day more than two days per week for more than a year duration. Ninety seven of the study subjects (25.3 %) were taking broad spectrum antibiotics, 54 (14.1%) were on anti-tuberculosis treatment and 15 (3.9%) were on antifungal medications at the time of examination (Table 1).

The predominant oral lesions found were dental caries 169 (44%), different forms of candidiasis 123 (32.0%) and periodontal diseases 89 (23.2%). Angular cheilitis 30 (7.8%) and molluscum contagiosum 17 (4.4%) were the predominant peri-oral lesions. Oral lesions were seen in

significantly high proportion among age groups above 40 years [(p=0.016, CI 1.47 (1.06 – 2.05)]. The distributions of both oral and peri-oral lesions were similar between male and female subjects (Table: 2).

Table 1: Oral habits, risk behaviors and medications used by study subjects

Factors that may affect oral and peri-oral lesions	N (%)
Means for oral hygiene	
tooth paste and brush	107 (28.2)
chewing sticks	217 (57.1)
rinsing with water after meals	56 (14.6)
Frequency of cleaning teeth	
once or more in a day	132 (34.7)
once in a day to week time	130 (34.2)
less than once a week	118 (30.7)
smoking cigarettes	
less than one pack year	3 (0.8)
one to five pack years	18 (4.7)
five to ten pack years	14 (3.6)
more than ten pack years	22 (5.7)
Alcohol consumption	52 (13.5)
Current intake of medications	
anti-fungal	15 (3.9)
anti-tuberculosis	54 (14.1)
broad spectrum antibiotics	97 (25.3)

There was a general trend of decreased oral and peri-oral manifestations with better income groups. Univariate analysis showed that oral (p=0.004 X² 11.14 df2) and peri-oral (p=0.001 X² 33.7 df2) lesions were associated

Table 2: Frequency distribution of oral and peri oral lesions with socio-demographic characteristics

Socio-demographic variables	Oral lesions		P- value OR (CI)	Peri-oral lesions		P- value OR (CI)
	Present (%)	Absent (%)		Present (%)	Absent (%)	
Age						
< 40 years	160 (41.7)	105 (27.3)	1.47 (1.06-2.05)	37 (9.6)	228 (59.4)	1.06 (0.96-1.17)
≥ 40 years	87 (22.7)	32 (8.3)		22 (5.7)	97 (25.3)	
Sex						
Male	81 (21.1)	45 (11.7)	0.09 X ² =8.07	22 (5.7)	104 (27.1)	0.88 X ² =1.21
Female	166 (43.2)	92 (24)		37 (9.6)	221 (57.6)	
Educational status						
Illiterates	52 (13.5)	28 (7.3)		11 (2.9)	69 (18)	
Read and write only	14 (3.6)	3 (0.8)		3 (0.8)	14 (3.6)	
Primary school	78 (20.3)	50 (13)		19 (4.9)	109 (28.4)	
Secondary school	90 (23.4)	41 (10.7)		23 (6)	108 (28.1)	
Tertiary	13 (3.4)	15 (3.9)		3 (0.8)	25 (6.5)	
Occupation						
Government employee	28 (7.3)	17 (4.4)	0.92 X ² =5.31	7 (1.8)	38 (9.9)	0.84 X ² =6.47
Private employee	24 (6.3)	18 (4.7)		7 (1.8)	35 (9.1)	
Merchant	11 (2.9)	10 (2.6)		4 (1)	17 (4.4)	
House wives	45 (11.7)	23 (6)		12 (3.1)	56 (14.6)	
House maids	26 (6.8)	12 (3.1)		6 (1.6)	32 (8.3)	
Daily laborer	20 (5.2)	12 (3.1)		1 (0.3)	31 (8.1)	
Unemployed	44 (11.5)	22 (5.7)		12 (3.1)	54 (14.1)	
Others	14 (3.6)	58 (15.1)		9 (2.3)	63 (16.4)	

with using means to clean their teeth; and the frequency of cleaning; oral ($p=0.038$ X^2 8.4 df2) and peri-oral lesions ($p=0.03$ X^2 7, df2) (Table 3). Both cigarette smoking (44 of 57) and significant alcohol consumption (40 of 52) were associated with oral lesions, $p=0.028$ (X^2 4.83 df1) and 0.041 (X^2 4.16 df1) respectively. Individuals who were taking broad spectrum antibiotics

were found to have significantly higher rates of both oral [($p=0.019$, OR 1.22 (1.05-1.41)] and peri-oral lesions [($p=0.008$, OR 1.89 (1.18-3.02)]. Patients on anti-tuberculosis treatment had a higher rate of peri-oral manifestation, but the oral lesions were not significantly higher. Patients on oral antifungal medications did not have a significantly higher rate of these lesions (Table 4).

Table 3: Association of Oral and Peri-oral Lesions with Oral Cleaning Habits

Oral habits	Oral lesions		P-value X^2	Peri-oral lesions		P-value X^2
	Present (%)	Absent (%)		Present (%)	Absent (%)	
Means of oral cleaning						
Tooth paste	58 (15.3)	49 (12.9)	0.035 X^2 8.6 df3	11 (2.9)	96 (25.3)	0.038 X^2 8.4 df3
Rinsing water after meals	45 (11.8)	11 (2.9)		23 (6.1)	33 (8.7)	
Tooth stick	141 (37.1)	76 (20)		24 (6.3)	193 (50.8)	
Frequency of cleaning						
At least once per day	76 (20)	56 (14.7)	0.038 X^2 8.4 df3	19 (5)	113 (29.7)	0.03 X^2 7 df2
A day to week gap	84 (22.1)	46 (12.1)		13 (3.4)	117 (30.8)	
Once in > 1 week	84 (22.1)	34 (8.9)		26 (6.8)	92 (24.2)	

Table 4: Effect of risk behaviors and medications on oral and peri-oral manifestations

Risk behaviors and medication used	Oral lesions			Peri-oral lesions		
	Present (%)	Absent (%)	OR (CI)	Present (%)	Absent (%)	OR (CI)
Risk behaviors						
Smoking (n=57)	44 (77.2)	13 (22.8)	1.24 (1.06-1.47)	11 (19.3)	46 (80.7)	
Alcoholism (n=56)	40 (76.9)	12 (23.1)	1.23 (1.04-1.46)	10 (19.2)	42 (80.8)	
Medications used						
Antibiotics (n=97)	72 (74.2)	25 (25.8)	1.22 (1.05-1.41)	23 (23.7)	74 (76.3)	1.89 (1.18-3.02)
Anti TB (n=56)	42 (75)	14 (25)		16 (28.6)	40 (71.4)	2.24 (1.32-3.67)
Anti-fungal (n=14)	9 (64.3)	5 (35.7)		2 (14.3)	12 (85.7)	

Oral lesions were significantly higher in those with significant weight loss (>10%) over the last six months. This was reflected in their body mass index. However, the peri-oral lesions were not significantly higher in patients with significant weight loss. Both oral and peri-oral lesions were significantly higher in patients with advanced HIV disease. From 247 of the subjects with oral lesions 182 (73.7%) had a CD4 count below 200; and 47 of 59 (79.7%) patients with peri-oral lesions had a CD4 count below 200 cells/ml. Stage four HIV disease was observed among 79 of 247 (32%) subjects with oral lesions and 30 of the 59 (50.8%) with peri-oral lesions. Peri-oral lesions were significantly higher among anemic patients with hematocrit less than 30%, OR=3.85, 95%CI (1.75-8.44) (Table 5).

Further statistical analysis was done using binary logistic regression to rule out confounding among factors found to have associations. This analysis showed that cigarette smokers were at 3 times higher risk of oral lesions ($p=0.005$). Other independent risk factors were low CD4 count (<200) ($p=0.039$) and advanced HIV stage diseases, stage 3 ($p=0.022$) and stage 4 ($p=0.046$). Those

who have a daily dental cleaning habit were protected from oral lesions ($p=0.021$). It was the frequency of cleaning but not the means of cleaning that was protective. Only the stage of HIV disease and the CD4 count were independent factors for the presence of peri-oral lesions (Table 6).

Discussion

Oral and peri-oral lesions in HIV/AIDS patients were found to be associated with many factors in this study. Frequency of cleaning teeth, cigarette smoking, having advanced clinical stage of HIV disease and a CD4 level below 200 were found to be independent risk factors for oral lesions among HIV patients. Taking broad spectrum antibiotics, means of cleaning and alcoholism were found to be confounding factors for oral lesions. Previous studies on oral lesions in Ethiopia were done among school children and diabetics (20, 23). There were no similar studies done in Ethiopia among HIV infected patients for comparison. But the frequency and characteristics of specific oral and peri-oral lesions were described in another study (24).

Table 5: HIV/AIDS disease stage, weight loss and anemia versus oral and peri-oral manifestations

Markers of disease progression	Oral lesions		P-value OR (CI)	Peri-oral lesions		P-value OR (CI)
	Present	Absent		Present	Absent	
Weight loss in the last six months	208 (54.2)	94 (24.5)	0.001, X ² 14 df2 0.014, X ² 8.5 df2	48 (12.5)	254 (66.1)	
BMI						
<18	110 (28.6)	40 (10.4)		31 (8.1)	119 (31)	
18.5 - 25	128 (33.3)	88 (22.9)		26 (6.8)	190 (49.5)	
>25	8 (2.1)	7 (1.8)		2 (0.5)	13 (3.4)	
CD4 count			2.88 (1.86-4.48)			2.37 (1.21-4.64)
<200	182 (47.4)	68 (17.7)		47 (12.2)	203 (52.9)	
≥200	65 (16.9)	69 (18)		12 (3.1)	122 (31.8)	
WHO stage						
I	11 (2.9)	16 (4.2)		0	27 (7)	
II	37 (9.6)	37 (9.6)		3 (0.8)	71 (18.5)	
III	120 (31.3)	56 (14.6)		26 (6.8)	150 (39.1)	
IV	79 (20.6)	28 (7.3)	1.22 (1.05-1.41)	30 (7.8)	77 (20.1)	2.68 (1.69-4.24)
Anemia (n=292)						
HCT <30 %	38 (13.4)	14 (4.9)		16 (5.6)	36 (12.7)	3.85 (1.75-8.44)
HCT ≥ 30 %	142 (50)	90 (31.7)		24 (8.5)	208 (73.2)	

Table 6: Final results of binary logistic backward regression with likelihood ratio among associated factors for oral lesions

Variables	Frequency	P- value	LR (95% CI)
Frequency of dental cleaning			
Once or more per day	132 (34.7%)	0.021	0.458 (0.236-0.89)
Day to week period	130 (34.2%)	0.324	0.717 (0.371-1.388)
Less than once per week	118 (30.7%)	-	
Smoking	57 (14.8%)	0.005	2.966 (1.314-6.693)
CD4 < 200	250 (63.1%)	0.039	1.811 (1.033-3.173)
WHO stage of disease			
Stage 1	27 (7.1%)	-	
Stage 2	74 (19.2%)	0.697	1.236 (0.425-3.595)
Stage 3	176 (45.9%)	0.022	3.275 (1.184-9.060)
Stage 4	107 (27.9%)	0.046	3.082 (1.022-9.295)

Those with age above 40 years had more frequent oral lesions in our study but age was not found to be an independent risk factor. Previous studies reported varying associations between age and presence of oral and peri-oral lesions. Oral candidiasis were found to be twice as common in patients over 35 years. But others reported increased oral lesions in younger age groups (7, 11, 12, 20). Advanced age may be associated with several other diseases and advanced HIV disease. In this study, there was no sex specific distribution of the lesions.

Though not independent risk, the frequency of the lesions had an inverse relation with income. This may be related to better oral hygiene practices and timely treatments for lesions. But it was seen that most patients were in poor socio-economic situations and there was a high prevalence of the lesions, 64% oral and 15% peri-oral.

The frequency of oral cleaning was found to be an independent protective factor from oral lesions. But only 34.7% of 384 clean their teeth at least once per day with most of them having less frequent cleaning habit. This could have also predisposed them to poor hygienic conditions and oral lesions. Oral cleaning may also be

deferred due to painful lesions. This shows the need to encourage frequent dental cleaning to prevent oral lesions.

Smoking, in our study, was found to be a high risk predictor for oral lesions. This was also noted in other reports. A direct relationship between cigarette smoking and oral lesions among HIV positive adults was described by Palmer et al, 1996, (11). However, Nittayananta et al, 2001 (12) found no relationship between current smoking and presence of any oral disease. Smoking affects the epithelial tissue and cause mucosal damage. Alcohol consumption was another risk for oral lesions but was not found to confer independent risk. Alcoholism was found to be a major risk predisposing for HIV infection itself as reported by Sime et al here in Addis Ababa (4). Such individual are also likely to have poor hygienic conditions and deficient of vital nutrients important for mucosal integrity.

The study done by Simon et al from Ethiopia showed lower frequency of oral lesions among patients taking anti-fungal drugs (20). But in this study, few patients were taking anti-fungal medications at the time of

examination and the relationship was not seen. Broad spectrum antibiotics and anti-tuberculosis drugs use were not found to be independent factors for oral and peri-oral lesions.

In our study, oral and peri-oral lesions were found to be statistically associated with several disease progression markers. Low CD4 count was one important finding noticed to be associated with such lesions. This finding correlates with the finding among Italian patients where CD4 count less than 300 cells/mm³ was found to be associated with higher incidence of oral and peri-oral lesions (21). Those subjects of the study in stage 3 and 4 HIV infection were also found with significantly higher oral and peri-oral lesions. Opportunistic conditions increase with decreasing immunity. Recurrence after treatment is high. Very sick patients are not able to keep their oral hygiene and also become dependent on others. In this study, behavioral assessment of the patients is subjective based on the words of the patients. This could be one limitation but still the results have demonstrated the importance of correctable risk factors of clinical use.

Conclusion

In general, this study showed that there are several factors associated with oral and peri-oral manifestations in HIV patients. Some of them are easily identifiable and correctable factors. These include cessation of smoking and increasing frequency of oral cleaning while managing advanced stage HIV disease. Thus, treatment and prevention of this major HIV related opportunistic oral and peri-oral health problems need multi-dimensional approaches.

Health care workers must look for oral and peri-oral lesions in all HIV patients in general and especially when they have one or several of the risk factors identified. The presence of oral and peri-oral lesions which are easily diagnosed with close observations must alert physicians to suspect the presence of HIV disease and also stage it. The treatment of such lesions encompasses life style modification, avoidance of risk behaviors, improving oral hygiene in addition to the management of HIV infection. This study also invites for further study.

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References

- UNAIDS—Special report on the global HIV/AIDS epidemic (2004).
- Ministry of Health, AIDS in Ethiopia, 4th edition (2004).
- Ministry of Health, Guideline for use of antiretroviral drugs in Ethiopia, Jan. 2005
- Sime A, Haile Mariam D, Worku A, The association between substance abuse and HIV infection among people visiting HIV counseling and testing centers in Addis Ababa, Ethiopia, *EJHD*, 2005;19 (2).
- Holmes HK, Stephen LXG, Oral lesions of HIV infection in developing countries, *oral diseases* 2002;8:40-43.
- WHO releases; New report on global problem of oral diseases, Feb 24, 2004, Geneva
- Sharma G, Pai KM, Suhas S, Ramapuram JT, Doshi D, Anup N, Oral manifestations in HIV/AIDS infected patients from India, *Oral diseases* (2006) doi:10.1111/j.1601-0825.2006.01232.x
- Federal Democratic Republic of Ethiopia, Ministry of Health, Planning and programming department, Health and Health related indicators, 2005/6.
- Robinson PG, Challacombe SJ, Sheiham A, Oral examination: a screening tool for HIV infection. *Sex. Transm. Inf.* 1998;74:345-48.
- Adurogbangba MI, Aderinokun GA, Odaibo GN, Olaleye OD, Lawoyin TO, Orofacial lesions and CD4 counts associated with HIV/AIDS in an adult population in Oyo State, Nigeria. *Oral Diseases*, 2004;10:319-326.
- P. Khongkuntlan et al. Oral manifestations in HIV positive adults from Northern Thailand. *J Oral Pathol Med* 2001;30:220-3.
- Wipawee Nittayananta. Coexistence between oral lesions and opportunistic systemic diseases among HIV infected subjects in Thailand. *J Oral Pathol Med* 2002;31:163-8.
- Kerdpon D et al: Oral manifestations of HIV infection in relation to clinical and CD4 immunological status in northern and southern Thai patients. *Oral diseases* 2004;10:138-144.
- Campisi G, Pizzo G, Mancuso S, Margiotta V. Gender differences in HIV - related oral lesions: an Italian study [Published erratum in *Oral Surg oral Med Oral Pathol Oral Radiol Endod* 2001;92:478]. *Oral Surg oral Med Oral Pathol Oral Radiol Endod* 2001; 91:546-51.
- Schmidt-Westhausen A, Grunewald TH, Reichart PA, Pohle D. Oral manifestations in 70 German HIV infected women. *Oral Dis* 1997;3(Suppl 1): S28-S30.
- Gileva OS et al. Spectrum of oral manifestations of HIV/AIDS in the Perm region (Russia) and identification of self-induced ulceronecrotic lingual lesions. *Med Oral* 2004;9:212-5.
- Greenspan JS, Barr CE, Sciubba JJ, et al and the US Oral AIDS Collaborative Group. Oral manifestations of HIV infection. Definitions, diagnostic criteria, and principles of therapy. *Oral Surg Oral Med Oral Pathol* 1992; 73:142-4.
- EC – clearing house on oral problems related to HIV infection and WHO collaborating center on oral manifestations of the immunodeficiency virus.

- Classification and diagnostic criteria for oral lesions in HIV infection. *J. Oral Pathol. Med* 1993; 22: 289-91.
19. Warren Thompson, R Gregory Lande, Alcoholism, medicine article, available at: www.emedicine.com, last updated June 6, 2007.
 20. Simon C, Tesfaye F, Berhane Y. Assessment of the oral health status of school children in Addis Ababa. *Ethiopian Med J.* 2003 Jul; 41(3):245-56.
 21. Mary Weinert et al: Oral Manifestations of HIV Infection. *Ann Intern Med*, Sep 1996; 125: 485 - 496.
 22. Conference reports, WHO cosponsored conference on oral health and disease in HIV/AIDS, Phuket, Thailand, 6-10, July 2004.
 23. Feleke Y, Neway M, Alemayehu M. Periodontal Disease and Dental caries in Ethiopian Diabetic patients. *Addis Ababa, Ethiopia. Ethiop Med J* 2000; 35; 303.24.
 24. Senbeta G, Yeweyenhareg F, Daniel F, Mekonnen N, Ermias D. Prevalence of Oral And Perioral Manifestations In HIV Positive Adults at Tikur Anbessa Teaching Hospital Addis Ababa, Ethiopia (in press).