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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. *Antimicrob. Agents Chemother.* 51: 1281-1286.

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## ARTICLES

### Research Articles

- Prevalence and utility of dipstick proteinuria in predicting renal insufficiency in treatment naive human immunodeficiency virus (HIV) infected Africans** 53  
Olufunmilayo A. Lesi, Oluwatosin O. Bamidele , Comfort M. Amira, Charles O. Okany and Alani S. Akanmu
- African and American university students and human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) transmission kissing perception** 60  
Tuntufye Selemani Mwamwenda
- Risky sexual behavior and identity construction among adolescents in Ethiopia** 65  
Belay Tefera and Missaye Mulatie
- Intestinal parasites and human immunodeficiency virus (HIV) status of children in Jos, Nigeria** 72  
Esther S. Yiltok, Sunday D. Pam, Stephen Oguche, Edmund B. Banwat, Stephen Yohanna, Emeka Ejeliogu, Olukemi Ige and Collins John
- Opportunistic infections among human immune deficiency virus (HIV) positive injecting drug users of Dhaka City, Bangladesh** 79  
Tanni Chowdhury, Obidul Huq, Provat Roy, Mesbah Uddin Talukder and Formuzul Haque



*Full Length Research Paper*

# Prevalence and utility of dipstick proteinuria in predicting renal insufficiency in treatment naive human immunodeficiency virus (HIV) infected Africans

Olufunmilayo A. Lesi<sup>1\*</sup>, Oluwatosin O. Bamidele<sup>2</sup>, Comfort M. Amira<sup>1</sup>, Charles O. Okany<sup>3</sup> and Alani S. Akanmu<sup>4</sup>

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**This study investigated the prevalence and associated factors of proteinuria in treatment naive human immunodeficiency virus (HIV) infected individuals. It also evaluated utility of dipstick urinalysis for the detection of impaired renal function. Two hundred (200) HIV seropositive patients and 72 HIV seronegative subjects were evaluated and tested for proteinuria using dipstick reagent strips. Serum urea and creatinine, haemoglobin, CD4+ T-lymphocyte (CD4+ cell) count and HIV RNA viral load were performed. Cockcroft-Gault (CG) equation was used to estimate glomerular filtration rate (eGFR). Dipstick proteinuria was detected in 85 (43%) of the seropositive population compared to 6 (8.3%) in HIV seronegative subjects (odds ratio (OR) 8.3,  $p < 0.001$ ). One hundred (50%) HIV positive subjects had CD4+ cell  $< 200$  cells at baseline and 63 (31%) had impaired renal function. Although dipstick proteinuria was associated with male gender, severe anaemia, elevated serum urea and creatinine, significantly lower CD4+ cell count and impaired renal function, only the inverse association of dipstick proteinuria and CD4+ cell count remained on logistic regression (OR 0.4, 95% CI: 1.6 to 5.2). We have documented the high prevalence of proteinuria in HIV subjects prior to anti retroviral therapy (ART), and the important role of proteinuria as a significant risk factor for severe immunosuppression. We also show that dipstick proteinuria is not sensitive for the identification of impaired renal function, but has moderate utility in excluding renal insufficiency in subjects negative for proteinuria on dipstick testing.**

**Key words:** Proteinuria, estimated glomerular filtration rate, immunosuppression.

## INTRODUCTION

Worldwide, chronic kidney disease (CKD) has become increasingly important as a complication of both HIV infection and anti-retroviral therapy, and is associated

with significant morbidity, mortality and progression of HIV infection to AIDS (Lozano et al., 2012; Estrella and Fine, 2010). Reports from prospective studies in developed

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developed countries suggest a marked racial predilection of human immunodeficiency virus associated nephropathy (HIVAN) for both black and Hispanic subjects (Estrella and Fine, 2010; Bickel et al., 2013; Ibrahim et al., 2012). This is a major concern as sub-Saharan African, a predominantly black population accounts for over 23 million people living with HIV who constitutes 69% of people living with HIV globally (UNAIDS, 2013).

Investigators from Congo, Ghana and various parts of Africa corroborate the importance of chronic kidney disease in HIV infected black Africans (Sarfó et al., 2013; Wools-Kaloustain et al., 2007; Franey et al., 2009; Longo et al., 2012). Histopathological evidence of glomerulosclerosis has been documented in a high proportion of HIV infected Nigerian patients with proteinuria and chronic kidney disease (Emem et al., 2008; Okafor et al., 2011). There is a need to identify subjects at risk of developing chronic kidney disease to ensure provision of early preventive measures to delay the onset and progression of renal dysfunction.

The current international guidelines recommend the determination of baseline renal function such as serum urea and creatinine, and evaluation of glomerular filtration rates prior to initiation of anti-retroviral therapy (ART) for the early identification of renal impairment and to guide selection of therapy (Gupta et al., 2005). These tests are however not readily available in resource limited areas and rural primary health centres in many parts of sub-Saharan Africa. As such, initiation of ART is often done without prior baseline renal function tests. The implication of this practice is the delayed identification of patients with pre-existing renal impairment who may require more intensive monitoring or may require alternative therapy.

Proteinuria, an early marker of renal disease, is often associated with chronic kidney disease and has been consistently documented in HIV associated nephropathy (HIVAN). Detection of proteinuria may therefore serve as a guide and surrogate marker for the identification of renal impairment in HIV infected populations. Point of care testing using urine dipstick is an efficient and inexpensive screening tool. It is relatively sensitive to detect proteinuria and can also measure the urine protein concentration semi-quantitatively. The aims of current study is thus set out to determine the prevalence of proteinuria in subjects with HIV infection using urine dipstick and explore the association of proteinuria with renal function tests and other HIV related factors.

## METHODOLOGY

### Study design

This prospective observational cross-sectional study was carried out at the HIV/AIDS treatment clinic of a tertiary care university hospital in Lagos, Nigeria, between July and December, 2011. The treatment centre is part of the 'President's Emergency Plan For AIDS Relief (PEPFAR)' supported sites, and provides general care of HIV/AIDS patients, including free ART.

Two hundred and seven consecutive ART naïve patients presenting

presenting for HIV care constituted the study population. Seven had incomplete data and were omitted from further evaluation. 72 random HIV sero-negative blood donors were recruited to serve as the control group for the evaluation of proteinuria. The study subjects were eligible for enrolment if they were at least 18 years of age and provided informed consent. Exclusion criteria were patients with pre-diagnosed hypertension, diabetes mellitus, tuberculosis, pregnancy, chronic kidney disease, liver disease, cardiac disease or any acute disease state within the past week. HIV status of all patients were confirmed by Western blot testing.

Fresh urine samples were obtained from all patients and tested for proteinuria using dipstick reagent strips (Atlas Medical, UK). Proteinuria was defined by the presence of  $\geq 1+$  protein on dipstick. The severity of proteinuria was classified according to the manufacturer's instruction (1+ mild proteinuria of  $> 30$  mg/dl/day, 2+ is moderate proteinuria of  $> 100$  mg/dl/day, and 3+ is severe proteinuria  $> 300$  mg/dl/day). Subjects with dipstick testing  $< 30$  mg/dl showed no colour change on dipstick and were considered negative for proteinuria.

Blood samples were also taken from the HIV seropositive subjects for haemoglobin (Autohaematology analyser, Mindray medical, China). Severe anaemia was defined as haemoglobin (Hb) values below 10 g/dl (Beutler and Waalen, 2005). Serum urea and creatinine were performed using the Roche Hitachi automatic analyser. Normal values for Urea and Creatinine were 2.6 to 7.9  $\mu\text{mol/L}$  and 50 to 140  $\mu\text{mol/L}$ , respectively as determined by the laboratory standards. The creatinine clearance was calculated using the Cockcroft-Gault formula (CGF) as an estimated Glomerular Filtration Rate (eGFR) (Cockcroft and Gault, 1979). This eGFR is recommended by the Infectious Disease Society of America (IDSA) guideline as the basis for dose modification of therapy in HIV subjects (Gupta et al., 2005). The estimated GFR of  $< 60$   $\text{mls}/\text{min}^{-1}$ ,  $72$   $\text{m}^2$  was classified as renal impairment. Severity of immunosuppression was determined using the CD4+ T-lymphocyte count (Partec Cyflow, Germany). HIV RNA Viral load evaluation was done using the Roche Amplicor version 1.5.

Data was analyzed with statistical package for social sciences (SPSS) Version 20 (SPSS Inc, Chicago, IL USA). Proportions were expressed as percentages. Categorical variables were compared using chi-square with statistical significance level set at  $P < 0.05$ . Variables associated with proteinuria, with a p-value  $< 0.05$  in univariate analysis were included in a multivariable analysis. The sensitivity and specificity of proteinuria was calculated using eGFR as the gold standard for renal function.

## RESULTS

A total of 272 patients were screened for proteinuria, of which 200 were HIV positive subjects undergoing pre-treatment evaluation and 72 were randomly selected HIV negative blood donors. Overall, there were 180 females and 92 males. The mean age  $\pm$  SD of the HIV positive subjects was  $36.7 \pm 9.14$  years and was similar to the mean age of the 72 HIV uninfected blood donors. The prevalence of proteinuria was 42.5% in HIV positive subjects compared to 8.3% in HIV negative subjects (OR = 8.3,  $p < 0.001$ ). The demographic characteristics of the study subjects based on HIV status are shown in Table 1.

### Baseline laboratory characteristics of HIV seropositive subjects

Mild proteinuria with dipstick 1+ was common and seen in

**Table 1.** Demographic characteristics of subjects based on HIV status.

Patient characteristic	HIV seropositive subjects	HIV seronegative subjects	P-value
	N = 200 (%)	N = 72 (%)	
Mean Age (SD)	36.73 (9.14)	36.39 (10.7)	
<b>Age group</b>			
< 29	38 (19)	5(6.9)	0.2
30-39	104 (52)	33(45.8)	
40-49	36 (18)	22(30.6)	
>50	22 (11)	12(16.7)	
<b>Sex</b>			
Female	133 (66.5)	47 (65.3)	0.9
Male	67 (33.5)	25 (34.7)	
M/F rate	2:1	1.8:1	
<b>Proteinuria</b>			
No	115 (57.5)	66 (91.7)	<0.001* , *OR=8
Yes	85 (42.5)	6 (8.3)	

\*OR: odds ratio.

**Table 2.** Baseline laboratory characteristics of HIV positive subjects.

Laboratory parameter	HIV seropositive subjects (n = 200)
Median Urea (IQR )	3.5 (2.8-4.6) mmol/l
Median serum creatinine (IQR)	100.6 (86.7-119.6) umol/l
Median hemoglobin (IQR)	10.5 (9-11.8) g/dl
Median CD4+ cells IQR	199 (87-344) ul
<200	100 (50%)
201-350	53 (25.6%)
351-499	31 (14.9%)
>500	17 (8.5%)
eGFR median (IQR)	67.8 (55.8-78) ml/min/1.73m <sup>2</sup>
GFR <60 mls/min/1.72m <sup>2</sup>	63 (31%)
Proteinuria present (all cases)	85 (42.5%)
+1 (>30 mg/dl)	56 (66%)
+2 (>100 mg/dl)	21 (24.7%)
+3 (>300 mg/dl)	8 (9.4%)
Plasma HIV RNA median (IQR)	69289 (4407-241,729) copies/ml
>50,000 copies/ml	110 (55%)

56 (65.8%) of the HIV subjects with proteinuria. Moderate and severe proteinuria with dipstick 2+ and 3+ were noted in 21 (24.7%) and 8 (9.4%), respectively. The baseline laboratory values for haemoglobin concentration, serum urea and creatinine are shown in Table 2. One

hundred (50%) of the population had marked immunosuppression with CD4+ cells less than 200, median HIV RNA was 69,289 copies/ml. 63 (31.5%) subjects had renal insufficiency with eGFR < 60 mls/min/1.72 m<sup>2</sup>.

**Table 3.** Relationship between proteinuria and baseline characteristic.

Patient characteristic	Univariate analysis		Multivariate Analysis		
	All proteinuria ( $\geq 1+$ )	Nil proteinuria	P value	OR (95% CI)	P value
	n=85, (%)	N=115, (%)			
<b>Gender</b>					
Female	48 (36.1)	85 (63.9)	0.007	1.9 (0.9-3.7)	0.053
Male	37 (55.2)	30 (44.8)			
Urea > ULN	9 (10.7)	2 (1.8)	0.007	3 (0.5-18)	0.3
Serum. Creatinine > ULN	17 (20)	8 (7.0)	0.005	2.1 (0.6-6.5)	0.2
Hb <10g/dl	43 (50.6)	40 (34.8)	0.018	0.6 (0.3-1.2)	0.23
CD4+ cells (ul/ml) < 200 cells/mL	55 (64.7)	45 (39.1)	0.0002	0.4 (0.2-0.7)	*0.0058
eGFR < 60mls/min/1.72m <sup>2</sup>	35 (41.2)	28 (24.3)	0.008	0.6 (0.3-1.4)	0.29
Plasma HIV RNA > 50,000 copies/ml (n,%)	53 (62.4)	57 (49.6)	0.048	-	-

Urea upper limit of normal (ULN- 7.9 umol/l), creatinine upper limit of normal (ULN-140 umol/l).

### Factors associated with proteinuria

The factors found to be significantly associated with dipstick proteinuria on univariate analysis were male gender ( $p = 0.007$ ), urea ( $p = 0.007$ ), serum creatinine ( $p = 0.005$ ), Hb < 10 g/dl ( $p = 0.018$ ), and CD4+ cells < 200 ( $p = 0.0002$ ) as shown in Table 2. Subjects with proteinuria were significantly more likely to have renal insufficiency than subjects without proteinuria, 35 of 85 (41.2%) and 28 of 115 (24.3%), respectively ( $p = 0.008$ ). Nevertheless, most (50 of 85, 58%) of the subjects with proteinuria had apparently normal eGFR. Overall, 35 (17.5%) of the HIV infected subjects in this study had both proteinuria and renal insufficiency. In the multivariate regression analysis, only the inverse association between CD4+ cell and proteinuria remained significant (OR = 0.4,  $p = 0.006$ ).

As shown in Table 3, the sensitivity and specificity of dipstick proteinuria to predict reduced eGFR was 55.5 and 63%, respectively. Significant proteinuria comprising of moderate (> 2+) and severe (> 3+) dipstick proteinuria was associated with a sensitivity and specificity of 19 and 88%, respectively. The negative predictive value of dipstick proteinuria to identify renal insufficiency was 75.2%.

### DISCUSSION

The prevalence of dipstick proteinuria was 42.5% in our study population of HIV seropositive patients undergoing pre ART treatment evaluation. These subjects had a significant 8-fold higher incidence of dipstick proteinuria compared to the HIV seronegative blood donors. This high prevalence of baseline proteinuria in this population is consistent with reports from other parts of sub Saharan Africa, and ranges from 26.1% in Western Kenya, 38 to

48% in Nigeria and 15% in Congo (Sarfo et al., 2013; Wools-Kaloustain et al., 2007; Longo et al., 2012; Okafor et al., 2011). Studies that include antiretroviral medicines (ARV) consistently reported lower prevalence of proteinuria in their study populations. Other reasons for these differences in the prevalence of proteinuria are related to the clinical and immunological stage of patient at presentation and methodology of protein evaluation.

The lower prevalence of dipstick proteinuria in the HIV seronegative study subjects is consistent with reports from normal subjects (Jotwani et al., 2012). In these populations, proteinuria is mostly physiological and transient, and caused by factors such as dehydration, emotional stress, fever, intense activity or inflammation that have minimal implications on morbidity and mortality. In longitudinal studies, repeat dipstick testing is done to identify subjects with persistent proteinuria at higher risk for chronic kidney disease. In the current study, we excluded individuals who were known have acute illness other than related to HIV seropositivity. We also excluded patients with risk factors for chronic kidney disease such as diabetes and hypertension, and pregnancy. However, we did not explore the role of emotional stress, dehydration or inflammation caused by asymptomatic urinary tract infection to exclude subjects with benign proteinuria.

### Dipstick proteinuria and renal Insufficiency

Evidence from prospective longitudinal studies suggests that in HIV-positive individuals, the combination of proteinuria and renal insufficiency are associated with faster progression to AIDS and death (Bickel et al., 2013; Beutler, 2005). In our study, 35 (17.5%) of the overall HIV infected study subjects had both proteinuria and renal

**Table 4.** Sensitivity and Specificity of dipstick proteinuria to identify renal insufficiency in HIV positive study subjects.

Parameter	All proteinuria $\geq 1+$	Significant proteinuria $\geq 2+$
Sensitivity	0.55 (0.4-0.7)	0.19 (0.1-0.3)
Specificity	0.63 (0.5-0.7)	0.87 (0.8-0.9)
PPV	0.41 (0.3-0.5)	0.41 (0.25-0.61)
NPV	0.75 (0.6-0.8)	0.70 (0.6-0.7)

PPV - positive predictive value, NPV - Negative predictive value.

insufficiency. This subgroup thus have a higher risk for chronic kidney disease (CKD) and drug toxicities, and require more intensive monitoring for appropriate dosage adjustment of ART such as tenofovir.

Many HIV clinicians commonly regard the presence of proteinuria to be an early marker of HIV associated nephropathy (HIVAN). Consistent with this observation, renal insufficiency occurred more commonly in subjects with proteinuria. However, over half (58%) of our study subjects with dipstick proteinuria had no evidence of renal insufficiency and had a normal eGFR. The role of dehydration, stress and asymptomatic infections that cause benign proteinuria even in normal populations was not pursued in this study but require further evaluation. Additionally, the presence of renal tubulo-interstitial disease that characteristically causes minimal or no proteinuria despite renal insufficiency requires further evaluation (Bickel et al., 2013).

It is notable that the sensitivity and specificity of urine dipstick to identify renal insufficiency were poor (Table 4). However, the specificity increased in subjects with moderate to severe proteinuria. Our findings corroborate the report of Gupta et al. (2009) and Siedner et al. (2008), and suggests that there are variably other causes of proteinuria aside from renal dysfunction (Drumheller et al., 2012). The role of other tests like urinary protein-creatinine ratios (uPCR) and association with renal insufficiency require further evaluation. It is important that all patients with significant proteinuria should have further examination of urinary sediment and renal function tests along with nephrology consultation.

### Proteinuria and immunosuppression

Although proteinuria was associated with various factors including male gender, elevated levels of urea and creatinine, severe anaemia, low CD4+ cells and reduced creatinine clearance, only the association of proteinuria with CD4+ count remained significant on multivariate analysis (Table 3). Our study therefore suggests that proteinuria is an independent risk factor for immunosuppression and possibly disease severity in HIV. The significant inverse association of proteinuria with

CD4+ cell count identified in our study corroborates studies done both locally and internationally (Gupta, 2009; Janakiraman et al., 2008). Gupta et al. (2009) suggested that proteinuria may be a surrogate measurement of greater systemic inflammation in patients at an advanced stage of immunosuppression. Consistent with this observation, severe CD4+ cell depletion has been associated with microbial translocation from the gut or opportunistic infections, some of which will affect the urinary tract leading to proteinuria independent of any HIV associated nephropathy (Brenchley et al., 2006). Resolution of proteinuria and immune restitution on commencement of ARV supports the role of systemic inflammation in the aetiology of proteinuria (Kalayjian et al., 2008). In this African population with severe immunosuppression, it is plausible that the high prevalence of dipstick proteinuria seen in over one-third of patients prior to initiation of ART may be largely due to systemic inflammation associated with low CD4+ cell counts. Longitudinal studies post ARV commencement and the association of proteinuria and immune activation needs further evaluation.

We identified some limitations to our study. Although urine dipsticks are considered effective screening tools for proteinuria, they may be less sensitive than newer tests such as uPCR. False negative results may occur with dilute urine or with proteinuria consisting primarily of proteins other than albumin as dipsticks detect albumin only. Similarly, false positive tests may be seen in the presence of severe haematuria. The Cockcroft-Gault formula has been used commonly in clinical practice and is widely used to adjust drug dosing for kidney function. However, serum creatinine-based estimated GFR among HIV-infected persons may be particularly biased due to associated altered metabolism, malnutrition and body mass abnormalities.

### Conclusion

Our study has shown that prior to initiation of ART, HIV infected subjects have significantly more proteinuria than seronegative subjects. We have documented the important role of proteinuria as a significant and independent

risk factor for severe immunosuppression. As a screening tool, dipstick proteinuria is not sufficiently sensitive or specific to identify renal insufficiency in HIV positive individuals. Nonetheless, it is useful in identifying renal insufficiency in subjects with moderate to severe proteinuria, and in excluding renal insufficiency in subjects negative for dipstick proteinuria. In the absence of better screening tools in resource poor and rural centres, all HIV positive patients should have dipstick proteinuria in the phase of pre-treatment evaluation and periodically during follow up to identify subjects with significant or persistent proteinuria. This will encourage early detection, prompt intervention and possibly reversal of the renal impairment. Detailed renal investigation and nephrology review is important for all subjects with significant or persistent proteinuria.

### Conflict of Interests

The author(s) have not declared any conflict of interests.

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*Full Length Research Paper*

# African and American university students and human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) transmission kissing perception

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The purpose of this study was to explore the extent to which kissing is associated with the transmission of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), based on literature review and respondents' to the questionnaire. The sample used was a diverse one, as participants were Americans and Africans drawn from universities in America, Kenya, South Africa and Tanzania, comprising a total of 424 respondents. Descriptive statistics consisting of frequency, percentage, chi-square and level of probability were used for determining the extent to which participants felt, regarding the association of HIV/AIDS and kissing, as a social and romantic manner reflecting affection and love. The analysis of data showed that university students based in America, South Africa and Tanzania did not think that there was any association between HIV/AIDS and kissing, whereas Kenya university students took the stance, which states that kissing is one of the modes by which HIV transmission occurs. The two positions are but a reflection of what was presented in the literature review. In conclusion, it was argued that the two divergent views call for a revisit, whether it is not in the interest of all concerned to take heed that indeed kissing has the potential of transmitting HIV, and that for this reason, it should be avoided as recommended by the American Center for the Control of Diseases and Prevention.

**Key words:** Deep kissing, human immunodeficiency virus (HIV) transmission, university students, saliva, divergent views, African and American students.

## INTRODUCTION

Since the discovery of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) over three decades ago, many questions have been asked for answers, research has been carried out in the quest for a cure, millions of people in every continent have died of AIDS, there are millions today who have attained the status of people living with AIDS (Mwamwenda, 2013a; Wikipedia, 2013; Tshoko, 2011; Naswa and Marfatia, 2010;

Sutton et al., 2011; Terry et al., 2005).

Alternative ways have been identified for prevention and control purposes in the absence of a permanent cure (Mwamwenda, 2013b; Mbonu et al., 2009; Olivera, 2006; Positive.Org, 2013). Moreover, sources of transmission and infections have been identified as: mother to child, blood transfusion, semen, vaginal secretions, sexual intercourse and exchange of needles (New York State, 2013;

Sith, 2004; Olivera, 2006). The list has been extended, as it is commonly reported that fluids like tears, saliva, kissing, mosquito bites, and urine may carry HIV (Youth Advocacy Group, 2012; Olivera, 2006; Cichocki, 2006; AIDS.Org, 2013; Gourab, 2013; If I Knew, 2012).

Regarding the extended list of sources of transmission, it has been modified by arguing that the quantity is so small that, it is unlikely to lead to the transmission of HIV/AIDS (New York State, 2013). Nevertheless, the speculation on kissing being associated with HIV/AIDS has not been silenced to date; asserting that, while there is a possibility for HIV/AIDS to be transmitted through deep kissing, the probability of this leading to HIV infection is extremely unlikely (New York State, 2013; Positive.Org, 2013; Gourab, 2013). AIDS Organisation (2013) on the other hand, further argues that, if such fluids are contaminated with blood, the chance or risk of contracting HIV/AIDS is a reality that cannot be ignored. "If a person has gum disease and they get blood, semen or vaginal secretions in their mouth, their risk of infection increases" (Youth Advocacy Group, 2012). In this scenario, the gum disease makes it easier for the virus to enter the human bloodstream.

Though transmission through saliva is a rare phenomenon, it has been reported and shown that HIV can be transmitted by human bites and saliva (Gourab, 2013). In 'If I knew' (2012), it is pointed out that, it is possible, but rare to contract HIV through kissing. It is argued that kissing is a safe behaviour and therefore, one cannot get infected by closed mouth kissing, and that there were no known cases of HIV being transmitted thus. Though the saliva of an infected person may contain a trace of HIV, "it will not transmit the virus" (If I knew, 2012). It is, nevertheless, argued that in the event of French kissing involving a partner who has open sore, blood in the mouth, and happens to be HIV positive, it is possible for transmission of the virus to occur. Therefore it is advisable to abstain from French kissing with such a person.

According to Pradeep (2004), a professor of Virology and Head of Microbiology, and In-Charge of HIV/AIDS Reference Centre, New Delhi, India dismissed dry kissing as means of HIV/AIDS transmission, but in the same breath, he argued that "The virus may enter the body through oral sex, and with French kisses in which saliva is exchanged". Cichocki (2006) narrates that kissing on the cheek, even for an HIV/AIDS person is very safe, as one's skin serves as a barrier to transmission. On the other hand, open mouth kissing does pose some risk of transmission, which is rather low to effectively lead to one being infected as such. While this is so, Cichocki (2006) warns that prolonged open-mouth kissing could lead to the damage of the lips or mouth, which may allow the HIV to enter the body through the bloodstream of an uninfected person.

AIDS Organization (2013) presents the argument that, in view of the blood contact that may result from French deep or open-mouth kissing, it is inadvisable to engage in

predisposition behaviour with an HIV infected individual. Similarly, Positive Organisation (1997) identifies four fluids that carry and transmit HIV, namely blood, breast milk, semen, vaginal secretion, but hastens to conclude that saliva is not a transmitter. On second thought, he proceeds to assert that, "Theoretically it is possible to contradict HIV through kissing". This is attributed to a setting in which both partners have cuts and sore in the mouth or bleeding gums. In light of this, it is recommended that It is best to abstain from deep kissing".

On a non-controversial free note, Olivera (2006) made a study of 1,000 senior high school students in Mumbai, India, with the objective of discovering whether they were of the view and knowledge that, it was possible to contract HIV/AIDS by mode of kissing. Most of the participants were highly knowledgeable about the methods of HIV/AIDS transmission as there were 95.8% who knew that HIV/AIDS is transmitted through blood transfusion, 89% were aware that HIV/AIDS is transmitted as a result of engaging in unsafe sex with an HIV/AIDS positive person and 82% were aware that HIV/AIDS is transmitted through infected needles. Despite such high level of HIV/AIDS knowledge, there were as many as 40% that were of the view that kissing would lead to HIV/AIDS transmission (Olivera, 2006).

The argument that kissing may be associated with HIV transmission is supported by two episodes that occurred two decades after the discovery of HIV/AIDS (Health, 1997; Youth advocacy Group, 2012). It was reported that a woman contracted HIV/AIDS from her partner who was HIV/AIDS positive. The American Center for Disease Control and Prevention (CDC) speculated that, it was transmitted through blood more than the saliva per se (Health, 1997). According to researchers, the level of HIV in saliva is too low to bring about HIV infection in an uninfected person. It is further argued that, within one's saliva, there are protein enzymes whose function is to bar the virus from attacking the white blood cells. It has been further reported that all other modes of transmission have been ruled out. As a result, it is concluded that, kissing is what led to the infection (Youth Advocacy Group, 2012; Health, 1997). In view of this, the CDC strongly recommends avoidance of deep kissing with an HIV infected person.

In light of the arguments presented, one seriously wonders whether it can still be denied that, kissing has an extremely low probability of being associated with the transmission. Moreover it also raises an important question to HIV/AIDS researchers, whether when research participants indicate in their questionnaires and interviews that saliva is a mode of transmission, should be scored as a misconception. This is partly what motivated the pursuit of the present investigation. Another case of a similar nature was an HIV infected woman who bit her partner, thus transmitting her HIV to him. By such a bite, the virus entered the bloodstream directly, thus infecting the man with the virus (Youth Advocacy Group, 2012).

## METHODOLOGY

The sample of the present investigation comprised university students consisting of American, Kenyan, South African and Tanzanian participants both males and females. The total number of participants added up to 424, with a distribution of 102 Kenyan university students, 164 South African university students, 100 Tanzanian university students and 58 American college students.

### Measuring instrument

The questionnaire comprised one question soliciting a response on the basis of three options, namely "Yes, No, Don't Know". All that was expected was to tick the option that was descriptive of what they knew about HIV/AIDS, as it relates to kissing an HIV/AIDS infected person. The question read as follows: "Would one get HIV through kissing a person who is HIV/AIDS Positive?".

### Procedure

Since the researcher could not be in all places at the same time, arrangement was made for university lecturers to be responsible for administering the questionnaire to their respective students. This was done after meeting what was expected of them by their institutions in administering such a questionnaire. The response to the questionnaire was preceded by the lecturer concerned explaining to the participants what was expected of them. They were also advised that they had the choice of responding to the questionnaire, if they so wished. In addition to the statement, participants were to fill in their gender and date of birth. For the purpose of confidentiality, participants were not permitted to write their names or institution of affiliation. On completion of the questionnaire, the lecturers collected the papers, which were sent to the researcher in New York for scoring and analysis.

## RESULTS

Descriptive statistics in the form of frequency, percentage, chi-square and probability were used as a method of data analysis as displayed in Table 1. The response to the statement for America was 60%, Kenya university 42%, South Africa 81% and Tanzania 61% who did not go along with the statement that, kissing an HIV/AIDS positive person would lead to the transmission of HIV. This held true for America, South Africa and Tanzania, but did not apply to Kenyan respondents who agreed that kissing would lead to the transmission of HIV. Among the four countries, South Africa scored the highest, followed by America and Tanzania whose scores were about at par. In terms of chi-square, the results were as follows;  $\chi^2$  (2df, N56) = 19.5,  $p < 0.001$  America;  $\chi^2$  (2df, N100) = 32,  $p < 0.001$  Kenya university;  $\chi^2$  (2df, N162) = 173,  $p < 0.001$  South Africa;  $\chi^2$  (2df, N98) = 43,  $p < 0.001$  Tanzania. All the values for the chi-square were statistically significant in favour of those who rejected the question that HIV would be transmitted through kissing, with the exception of Kenya where the result were in the opposite direction, as more respondents indicated that indeed, one would become infected as a result of exchange of kisses. In summary, the analysis of data showed

showed that African and American university students with the exception of Kenya rejected the notion that an individual would contract HIV/AIDS on the basis of kissing. Kenya African University students went along with the question that kissing can lead to the transmission of the virus. In terms of percentage points, South Africa had the highest score followed by both America and Tanzania who performed equally at the middle level, with South Africa being at the top and Kenya the fourth and last position.

## DISCUSSION

In view of the controversial nature of HIV/AIDS, people all over the world have had interpretations and beliefs that are at variance. Apart from the commonly held and accepted various modes of transmission and infection such as: blood transfusion, sharing of needles, sexual intercourse, mother to child infection, the list has been extended to saliva through exchange of social and romantic kisses. The question of HIV being transmitted through kissing has been rather controversial as different views have been divergent rather than convergent. It was with this background that this investigation was undertaken. The sample comprised 424 African and American university students drawn from America, Kenya, South Africa and Tanzania. Specifically, the investigation sought to solicit from respondents their views as to whether they subscribe to the notion that kissing would be considered to be one of the modes by which HIV/AIDS is transmitted.

As narrated in the analysis of data, the outcomes showed that there were those who went along with the question, and those who rejected the notion that HIV would be transmitted through kissing. However, the differing respondents were not of the same magnitude numerically. Of the four participating countries, Kenya registered her position of accepting that indeed kissing was a source of HIV/AIDS transmission. America, South Africa and Tanzania rejected the notion that HIV/AIDS is transmitted through kissing. According to the scoring criterion, those who rejected the statement were supposed to be correct, notwithstanding the fact that, the review of literature on HIV/AIDS is divided. It therefore raises an important question regarding the scoring of questionnaires, where technically speaking both answers are actually correct based on empirical evidence.

Another issue that arises from this investigation is the size of respondents from the four countries and their responses. Other than South Africa which had a score of 80% correct responses; the remaining countries scored rather low, thus showing that the number of those who had misconception was rather substantial to be a matter of concern. Indicating, as it did, that the effect of public education on HIV/AIDS has not gone far enough to spread the needed message to the millions of people the world over who are faced with the threat of contracting the disease in their lifetime.

**Table 1.** Frequency percentage Chi-Square and probability for the question: Would one get HIV through kissing a person who is HIV/AIDS positive? N 424

Country	Frequency	%	$\chi^2$	P
America N=58	35	60	19.5	0.001
Kenya N=102	43	42	32	0.001
South Africa N=164	133	81	173	0.001
Tanzania N=100	61	61	43	0.001

Theoretically, as well as in comparison and contrast, the findings of the present investigation are in alignment with what other researchers have reported. For example, Olivera (2006) in his study among senior high school students in Mumbai, India reported that there were as many as 40% of respondents who believed that kissing was indeed one way one would be infected with HIV/AIDS. Sith (2004), a professor of virology and in-charge of the Centre for HIV/AIDS advanced the argument that deep kissing can lead to transmission of HIV. The same view is held by the American Center for the Control and Prevention of Diseases. Such view gained support from the Kenyan participants who held the view that indeed HIV can be transmitted by kissing. There are other researchers who are considered to be correct, who vehemently have rejected the notion that kissing is a viable mode of HIV/AIDS transmission (Youth Advocacy Group, 2012; Positive.Org, 1997; AIDS, 2013). These are in convergence with respondents from America, South Africa and Tanzania who share such view, and considered politically correct by the majority of people, though this does not resolve the existing controversy on HIV/AIDS in terms of its impact on the lives of millions of people, particularly in Sub-Saharan Africa which leads the whole world in the number of people who have died because of HIV/AIDS, as well as the set of millions of those who are living with AIDS (Wikipedia, 2013).

## Conclusion

The results of the present investigation are that, respondents showed two divergent views regarding the association between HIV transmission and kissing. The majority were of the view that there is no relationship between kissing and the transmission of HIV. The other set of respondents, which would constitute the minority has taken the stance that, there is a relationship between the two variables. Such outcomes are a reflection of what has been presented in the literature review emanating from those who are considered experts in the field of HIV/AIDS science. That alone constitutes a paradox in the debate about the relationship between kissing and HIV transmission. Such ambiguity does not contribute meaningfully to the cause of combating HIV/AIDS in the best possible way. Even if the argument that there is a

relationship is accepted; it can be argued that if indeed there is a relationship, then those engaged in kissing, should avoid people who are HIV positive.

This is not sound admonition, given that there are people who are HIV positive, and yet they are not even aware of this. So, how does one relate to such a situation? There are those who are aware that they are HIV positive, and yet they keep it a secret for fear of the HIV/AIDS stigma in society. The argument that it is extremely unlikely to contract HIV, because the quantity of HIV contained in their saliva is too small to bring about HIV transmission is not a sound one either. Who is there to monitor and control the amount that will be secreted or released? No one in his or her sound mind would want to risk the safety for life because of a romantic or social kiss. Therefore, it is important take heed that it is unsafe to engage in kissing for health reasons.

## Conflict of Interests

The author(s) have not declared any conflict of interests.

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*Full Length Research Paper*

# Risky sexual behavior and identity construction among adolescents in Ethiopia

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Adolescents in Ethiopia are found to engage in a host of risky behaviors that lead to sexual and reproductive health problems including Human Immune Deficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS), unplanned pregnancy, and abortion; just to mention but a few. Quite a number of research investigations have been conducted to document on the factors that lead youth to these risky behaviors. However, these investigations focused to a greater extent on the external factors orchestrating risky ventures. There is a paucity of interest to examine the extent to which the internal, developmentally salient, and functionally overwhelming dimension of adolescent development, called “personal identity construction”, structure risky orientations in young persons. This research was attempted to fill in this gap. It attempts to investigate if identity achievement can play the protective role against risky sexual behaviors among young people. Three hundred and two adolescent students were selected from three schools in North Gondar Administrative Zone. The results revealed that only some students had achieved their identity and yet a greater majority had experience of sexual intercourse at least once in their life. However, as compared to identity achievers, non-achievers were significantly more engaged in sexual intercourse, had sex with multiple partners including sex with commercial sex workers, engaged in casual sex, and failed to use birth control and condom in different sexual encounters. Therefore, significant proportion of identity non-achievers were more exposed to these risky behaviors than identity-achieved adolescents.

**Key words:** Risky, sexual behavior, identity construction, human immune deficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), adolescents.

## INTRODUCTION

Adolescence is a critical period of development of sexuality that in some instances may involve ‘risky sexual practices’ (Margaret and Lynn, 2000) leading to unwanted pregnancy, abortion, Human Immune Deficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and other sexually transmitted infections (Tewabe, 2009).

Available data indicate that adolescents and young adults are the age groups that are most at risk (Negash et al., 2003) to sexual and reproductive health problems to such an extent that these needs have emerged in more recent years as an issue of great concern for governments, civil societies, community-based organizations,

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and other stake holders (Tewabe, 2009). More specifically, findings from reviews of extensive research on HIV/AIDS, in young persons from developing countries, generally suggest that young people are at the center both in terms of new infections as well as being the greatest potential force for change if they can be reached with the right interventions (Auerbach et al., 2006).

The review of the effective and promising interventions for preventing HIV infection indicates that there is a large quantity of evidence from experimental and observational research as well as from practical real-world experiences both in developed and developing countries, in fact supporting the implementation and scale-up of a number of interventions and strategies (Auerbach et al., 2006).

At the same time, however, findings indicate that there is a need to continue to develop new and more effective interventions, while attending to a number of behavioral and social issues that cut across virtually all interventions designed to prevent the spread of HIV. Such conclusion naturally follows from a number of studies conducted in different countries in Africa reporting the disparity between young people's knowledge about HIV/AIDS and reported protected sexual behaviour (Hoffmann et al., 2006; Odutolu, 2005).

This would then invite a visit into some less emphasized (endogenous rather than exogenous) structures that give developmental overtone to researching risky sexual behaviors in adolescence. Development of personal identity is one such endogenous factor that basically structures the entire psychological functioning of young persons during the period of adolescence. This being the case, such major developmental concern of adolescence has, however, heeded little attention so far in researching risky adolescent ventures. Only few studies were conducted on identity development and any aspect of sexuality (Dunkel and Papani, 2005).

The same holds true with research studies in Ethiopia. There are only few local studies that show the importance of sexual experiences (either healthy or risky sexual behavior) in the process of identity formation among adolescents. Therefore, it is of paramount importance to investigate the issue of vulnerability to risky sexual behaviors of those (young persons) who are developmentally set with identity exploration and definition but in a context of development where discussing about sex is considered in many cases as a cultural taboo, child socialization or parenting is stricter and authoritarian discouraging independence and risk taking particularly in girls, dating and pre-marital sex are as yet not welcomed, but regarded rather as shameful and an embarrassment to family, and the unwritten curriculum so far is of a nature, for example, that, a "good" adolescent is expected to be submissive and ignorant about and issues related to sex. Conforming to these expectations would, on the other hand, mean depriving the self of opportunities for development of personal identity.

There appears an apparent dilemma here: withholding

sexual exploration for the purpose of avoiding sex-related health problems or letting adolescence without sense of personal identity. So, the main question is how to negotiate adolescents' identity exploration which is inevitable and health risk outcomes as a result of sexual explorations and experimentations. It is, in this regard, believed that fundamental to conduct a study on identity development to shed light on this question and in doing so develop an understanding of adolescent sexuality in a new light in our attempts to fight against the outcomes of unprotected sex. Hence, helping young people to explore identity alternatives in a systematic way and to consolidate a sense of identity among the alternatives is useful in prevention and intervention programming efforts. Moreover, having such knowledge is useful in developing and implementing prevention and intervention efforts of sexual-related to health problems.

This research was, therefore, conducted to assess how identity exploration, consolidation and formation would relate to vulnerability to risky sexual behavior among young people in North Gondar and suggest implications for intervention.

## MATERIALS AND METHODS

### Participants and sampling

There are a total of 36 lower secondary, 16 upper secondary (preparatory) and 3 post-secondary schools or colleges in the North Gondar Zone. Keeping issues of accessibility, feasibility and technical convenience closely in picture, the target population was delimited to educational institutions or schools; one school from each level: Dabat Secondary and Preparatory School, Fasiledes Preparatory School, Kola Diba Preparatory School, and Gondar College of Technical, Vocational Education and Training.

Initially, 310 young persons were sampled from these schools. However, the responses of eight participants were discarded for incompleteness of the filled-in questionnaire and hence 302 students' responses were found legible for analysis. About 180 (59.6) participants were males, while the rest 122 (40.4%) were females. The number of participants considered in the sample was comparable across schools.

The procedure of sampling was such that the population of students in the North Gondar Zone was firstly stratified based on educational levels (secondary, preparatory and college levels) to ensure representation of young persons across ages. The three levels need to be represented in view of the fact that identity development is a process that spans over the years rather than being an event that happens in one specific stage. Besides, taking participants from different strata with different age levels is a powerful way to enhance external validity or generalizability of a study (Creasey, 2006). Accordingly, the study sites were further stratified by grade levels and one section was randomly selected from each grade as a final sampling frame. Besides, the 310 participants were recruited proportionally from the aforementioned four schools.

### Measures

Two important measures were used for data collection: "Personal Identity Measure" and "Risky Sexual Behavior Measure". The Extended Measure of Ego Identity Status (Adams, 1989) was used

**Table 1.** Identity status of respondents.

Identity type	Frequency	Percent
Identity achieved	131	43.38
Identity non-achieved	171	56.62
Total	302	100

to examine 'Personal Identity Status'. This scale attempted to determine the presence or absence of exploration and commitment in the areas of vocation, occupation, politics, life styles, recreational choices, friendship and gender roles. Exploration of identity requires a person to struggle or actively question so as to arrive at a decision about goals, values and beliefs on domains of identity status. Commitment, on the other side, involves making choice about identity domains or elements and engaging in implementation of already chosen components (vocational choice, religious beliefs, gender role attitudes, family roles and sexual expressions).

It consisted of a total of 64 items that required participants to rate themselves on a four point scale (strongly agree=4 and strongly disagree=1) regarding the extent to which they possessed the qualities expressed. Some of the items that were used to measure identity non-achievement included items like, "I do not think about dating much, I just kind of take it as it comes"; "I'm still exploring the many possibilities to find the right kind of friends for me". On the other hand, some of the items that were used to measure identity achievement included items like, "I have dated different types of people and know exactly what my own "unwritten rules" for dating are and who I will date; Based on past experiences, I have chosen the type of dating relationship I want now".

The 'Risky Sexual Behavior Measure' was composed of a checklist of eight items including casual sex, having sex with multiple partners, having paid sex and failure to use condom in such sexual activities (Russian Institute of Nutrition, 2001).

The reliability index of the items that were supposed to measure diffusion and foreclosure status were found to be 0.68 and 0.72, respectively. In addition, the reliability of items on moratorium and achievement identity status subscales was found to be 0.73 and 0.83, respectively. Overall, the foreclosure, moratorium and achievement subscales have good reliability. The wordings of some items on the diffusion subscale were modified for it has relatively lower reliability value. The reliability of the second tool designed to measure sexual practices was also checked. The computed reliability coefficient of items that assess sexual practices of participants was found to be 0.84. This is a very good reliability index to measure the construct, sexual experience.

The instruments were also checked for content relevance and cultural sensitivity, translated into the native language of respondents, and then pretested. Some defective items were discarded; few other items that lacked in clarity were rewritten. The final questionnaire was administered separately at each school by pulling up sample participants from all the grades together.

Once the data were secured, analysis begun by determining the identity status of individuals. This was done by employing 'median-split technique (Balistreri et al., 1995). That is, after summing up the total scores of each participant on the exploration and commitment dimensions, it was found out that a median score of 65.5 and 62 were used as cut of points, respectively for exploration and commitment dimensions to categorize scores into identity achievement and non-achievement. Accordingly, participants who scored above the median scores on both exploration and commitment dimensions were defined as 'identity achievers'. But, those participants who did not score above the median scores either on one or both exploration and commitment dimensions were defined as 'identity non-achievers'. Assumption-free statistic, Chi-

square ( $\chi^2$ ), was used to test the significance of association that identity status has with sexual experiences, and other safe sex practice measures.

## RESULTS

The analysis was started by examining the status of participants on identity achievement and sexual experiences of the participants. This analysis serving as a foundation, the next analysis shall attempt to determine the association between identity status and sexual experiences. The third part shall attempt to examine the association between identity status and risky sexual practices.

Regarding identity development, there are two defining criteria to categorize individuals into different identity status. These criteria are the presence or absence of exploration of alternatives and commitments in different domains such as vocational plans, religious beliefs, political beliefs, dating, sexuality, friendship, family roles and sex role preferences. Identity achievement entails then engagement in exploration and experimentation with commitment to such engagements. The summary data on Table 1 depicts the proportion of cases that were found to exhibit achievement of identity as a result of this sustained exploration and commitment.

As shown in Table 1, only 43.38% have achieved their identity whereas more than half (56.62%) were identity non-achievers. This shows that many young persons in rural cities of the Amara region are only in the process of forming or consolidating their identity and identity achievement is more likely to extend to the age normally designated for adulthood.

Part of identity development in adolescence is definition of sexuality. This search for one's sense of sexuality will implicate on a number of sexual activities including dating and sexual intercourse. The data summarized in Table 2 shows a significantly more number of boys were engaged in sexual activities than girls ( $\chi^2 = 10.85$ ,  $P < 0.05$ ). That is, half (50%) of male participants had involved in sexual activity at least once in their life as compared to less than half (40%) female participants who had the same experiences. The onset of sexual intercourse (Table 4) was reported to be 18.16 years. It can also be seen on Table 2 that out of those who had some kind of sexual experience, a significantly higher number of boys had relationship with more than one partner, while the majority of girls had relationship only with one partner ( $\chi^2 = 8.23$ ,  $P < 0.05$ ). In the same way, we can still understand from Table 2 that the duration of relationship for boys is significantly lower than girls ( $\chi^2 = 8.23$ ,  $P < 0.05$ ).

### Identity achievement and sexual experiences

Table 3 shows that there is a significant difference in sexual experience between identity achievers and non-achievers ( $\chi^2 = 27.66$ ,  $P < 0.05$ ). Out of the total of 171 experiences as compared to the 31.30% of the identity

**Table 2.** Sexual experiences by sex.

Sexual experience		Sex				df	$\chi^2$
		Male		Female			
		Frequency	Percent	Frequency	Percent		
Ever been involved in sexual activities	Yes	91	50.4	40	35.71	1	10.85*
	No	57	49.6	82	64.29		
	Total	180	100	122	100		
Number of partners	Single (one partner)	37	40.65	26	65	1	8.23*
	Multiple (two or more partners)	54	59.35	14	35		
	Total	91	100	40	100		
Duration or term of relationship	Long(> 6 weeks)	34	37.4	33	82.5	1	21.72*
	Short(< 6 weeks)	57	62.6	7	17.5		
	Total	91	100	40	100		

\*P&lt;0.05.

**Table 3.** Proportion of those who ever had sexual intercourse by identity status.

Identity Status	Frequency	Percent	df	$\chi^2$
Achievers	41	31.3	1	27.6*
Non-achievers	90	52.63.		

\*P&lt;0.05.

**Table 4.** Onset of sex in years.

Identity status	Min	Max	Mean
Achievers	15	22	18.25
Non-achievers	14	20	18.1
Total	14	20	18.16

achievers. However, the average age of onset of sex for the identity achievers and non-achievers group appears comparable (18.25 and 18.1 years, respectively) as indicated in Table 4.

The basic question is "how far identity definition of young persons is associated with risky sexual experiences?". When we see number of partners in life time, the Chi-Square test shows significant difference between identity achievers and non-achievers ( $\chi^2 = 4.56$ ;  $p < 0.05$ ). Out of 41 sexually engaged identity achieved participants, only some (29.27%) had multiple (more than one) sexual partners. In contrast, of the total 90 sexually engaged non-achievers, more than half (57.78%) had single sexual partner. This shows that, those participants who did not achieve their identity were engaged with multiple sexual partners much more than identity achievers. The other interesting issue pertains to the extent to which identity status is associated with safe sex; mainly condom use and use of birth control (Table 5).

Moreover, as shown in Table 5, there is a significant difference between identity achiever and non-achiever groups in terms of use of birth control during sexual intercourse ( $\chi^2 = 8.67$ ,  $P < 0.05$ ). A large proportion of identity non-achievers (64.45%) did not use any birth control in their sexual relationships as compared to identity achievers (26.85%). With respect to casual sexual experience, there is again a significant difference between identity achiever and identity non-achiever groups ( $\chi^2 = 5.75$ ,  $P < 0.05$ ). The proportion of identity non-achievers (48.89%) having casual sexual encounters was significantly higher than the proportion of identity achievers (46.34%) who did the same. Casual sex is also expressed in adolescents' failure to use condom. It can be observed in the same table that only small proportion of identity non-achievers used condom when they had casual sex. In contrast, relatively lower proportion of participants who had achieved their identity failed to use condom in casual sex than those of identity non-achievers ( $\chi^2 = 5.66$ ,  $P < 0.05$ ).

Finally, the previous table (Table 5) still shows that there is a significance difference between identity achievers and non-achievers in the extent of engagement in commercial sex ( $\chi^2 = 7.35$ ,  $P < 0.05$ ). Only few (12.20%) of identity achieved participants had commercial sex, whereas 26.67% of identity non-achievers had commercial sexual experience. And, about half (50%) of identity non-achievers used condom when they had commercial sex.

## DISCUSSION

Personal identity formation occurs as individuals develop a secure and enduring sense of self that encompasses an integrated set of personal interests, values, goals and commitments. Adolescence and youth are the periods in which individuals are expected to achieve a sense of personal identity. The developmental progression or movement from less advanced identity status to a higher identity status is found to be a function of age (Macinnon, 2002). It was found that the proportion of identity diffusion declines, while the proportion of identity achievement increases with age (Marcia, 1993). It was observed that foreclosure or premature identity achievement is the most frequently observed during high school years and it declines with increasing age (Marcia, 1993). Similarly, in one study (Muuss, 1996), 68 and 32% of 12 years old participants were found to have identity diffusion and foreclosure, respectively. However, at the age of 24, more than half (56%) achieved their identity (Muuss, 1996). The findings of this study seem to show that only some students have achieved identity. In fact, previous studies have also shown that not all adolescents attain identity (Louden, 2005; Marcia, 1993; Waterman, 1993).

While identity achievement obviously gets likely with age, progression to a higher identity status is still a function of culture implying that beyond the factor of age, the situation of identity development may take a different picture for individuals of different cultural backgrounds. Cross cultural studies have, for example, shown that living in a collectivist contexts, like that of Ethiopia, tends to struggle to integrate their own individual identity with the norm of the collectivist society which emphasizes conformity, communal rules and close relationships (Gardiner and Kosmitzki, 2008.)

Likewise, the Ethiopian collectivist culture, unlike the individualistic culture of the Western World, demands adolescents to conform to the values, norms and cultural standards of the society. This cultural scenario seems to give a reduced space for individuation. In Ethiopia, it seems that rather than achieving identity through judging oneself as an individual, much emphasis is given to social and cultural norms. Adolescents are not often allowed and supported to search their own identity, but are rather forced to strictly follow parental religion, vocation, political thought and belief.

An important dimension of identity construction is sexual definition. When it comes to status on sexuality, it was found that nearly half of the participants had experienced sexual intercourse at least once in their life. Cross-national studies conducted in Sub-Sahara Africa countries have also shown high prevalence of sexually active adolescents as compared to developed nations (Gueye et al., 2004; Gupta and Mahy, 2004; King, 1996; Negussie et al., 2002). It was noted that at the age of 20, about 80% of adolescents were sexually active in Sub-Sahara Africa as compared to 75% in developed nations

(Negussie et al., 2002). Surprisingly, many adolescents have their first sexual experiences before the age of ten (Ateka, 2001).

In fact, the average age of the onset of sex in this study (18.15 years) was found to be higher than those previously reported: 16.38 and 16.5 years for girls and 17.4 years for boys in Addis Ababa (Amuyunzu-Nyamongo et al., 1999).

It was also observed in the present study that significantly more number of boys had sexual experience once in their life with more number of sexual partners and shorter period of relationship than girls. Similarly, much more than females, male students in some selected high schools in Addis Ababa were engaged in sexual practices (Feben, 2005). According to Social Role Theory, sex differences in sexual activities have been attributed to gender role differences prescribed by society and the difference is more pronounced in cultures where more traditional gender roles are practiced (Dunkel and Papani, 2005).

The question is then 'how is identity definition related to sexual activity?' Obviously, identity formation requires young people to engage in the process of exploration and experimentation. It is during adolescence and youth that individuals start experimenting on sex and engage in different sexual activities (like masturbation, fantasies, kissing, fondling and sexual intercourse), because sexuality is considered as one way of exploring who they are (Furman and Shaffer, 2001; Steinberg, 1993).

Such exploration is in fact normative during adolescence, but may be associated with risky behaviors (Schulenberg and Maggs, 2010) or instability as well as potentially health-compromising experimentation of sex that may lead identity non-achievers to choose risky behaviors based on anticipated immediate consequences, even in the presence of negative long-term consequences (Schulenberg and Maggs, 2002).

Despite the possibility for such serious consequences, exploration and experimentation of sexual activities may also serve important and constructive functions in helping adolescents make friends or explore personal identities and clarify who they are and what they should be. As a result, some have questioned the wisdom of attempting to limit experimentation and exploration, because this may leave individuals without a self-determined commitment to an identity and to personal values (Schulenberg and Maggs, 2002).

The findings of this study seem to support the importance of identity achievement in the sense that significantly more number of those who did not achieve their identity had ever involved in sexual intercourse at least once in their life as compared to identity achievers (Waterman, 1993). The problem with such sexual experience was that it appeared to be risky: identity non-achievers were found to lack in commitment, thus having significantly more number of sexual partners, were engaged in casual and commercial sex significantly higher

**Table 5.** Number of sexual partners, casual sex, commercial sex without condoms and use of birth control by identity status.

Issue	Identity status				df	$\chi^2$
	Achievers		Non- achievers			
	Frequency	Percent	Frequency	Percent		
Those having multiple sexual partner	12	29.27	52	57.78	1	4.56*
Those having casual sex	19	46.34	44	48.89	1	5.75*
Those not using condom in casual sex	11	57.90	34	77.28	1	5.66*
Those having commercial sex	5	12.20	24	26.67	1	7.35*
Those having commercial sex without using condom	2	40	12	50	1	7.20*
Those failing to use birth control	11	26.83	58	64.45	1	8.67*

\*P&lt;0.05

higher than the identity achievers, and had shorter sexual relationships (that increases the likelihood of sexually transmitted diseases (STDs) and reproductive health problems like HIV/AIDS) and yet significantly relatively smaller number of them were using birth control including condom use.

Evidences also indicate that individuals characterized by lack of commitment (have not achieved identity) likely to have more than one (multiple) sexual partner and often shallow less intimate and casual lasting for a short period (Orlofsky, 1993). On the other hand, identity achievement is found to protect young persons from unprotected and casual sex which lead to health problems (Maticka-Tyndale and Brouillard-Coyle, 2006; Schulenberg and Maggs, 2010), promote deeper, intimate, and enduring sexual relationship with a partner (Karl, 1989), and correlate positively with lower incidence of health compromising behaviors (risky sexual behavior) and negatively with unprotected, casual, and intoxicated sex (Schulenberg and Maggs, 2002). Identity achievement that involves consistency of self across time and place (identity consolidation) may potentially protect young people from casual and unprotected sex (Schulenberg and Maggs, 2002).

## Conclusion

As compared to those identity achiever young persons, achieve non achievers had ever involved in sexual intercourse at least once in their life. In addition, identity non-achievers had more number of sexual partners and casual sexual relationships than identity achievers. Moreover, much more than identity achievers, identity non-achievers were engaged in commercial sex which exacerbates their vulnerability to STDs including HIV/AIDS. Hence, identity achievement or consolidation (consistency of self across time and place) likely reduces vulnerability of young persons from HIV/AIDS and other STDs.

## Conflict of Interests

The author(s) have not declared any conflict of interests

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Full Length Research Paper

## Intestinal parasites and human immunodeficiency virus (HIV) status of children in Jos, Nigeria

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Intestinal parasitic infestations (IPI) are not uncommon in immunocompetent individuals. However, human immunodeficiency virus (HIV)-infected individuals with depleted immunity have an abnormally high susceptibility to infections. This study therefore, examines children with intestinal parasites according to HIV status and degree of immunosuppression. Consecutively consenting patients aged 1 to 15 years attending the Paediatric Clinic of acquired immune deficiency syndrome (AIDS) Prevention Initiative, Nigeria, were recruited as cases, while age and sex matched HIV negative controls were recruited from Out Patient Department of Jos University Teaching Hospital. Stool samples were examined for parasites by direct wet mount, formol-ether and modified Ziehl-Neelsen technique. Levels of immunosuppression were assessed amongst HIV-positive subjects. Five hundred and ten children aged 1 to 15 years equally divided between the two cohorts were enrolled for the study. Seventy-nine had IPI, giving a prevalence rate of 15.5%; 44 (8.6%) HIV positive and 35 (6.9%) HIV-negative children. The most prevalent extracellular parasite was *Giardia lamblia*, however HIV positives had significantly higher rate of *G. lamblia* infestation. Among the intracellular parasites, the infection rate in HIV-positive subjects (5.9%) was three times that in HIV-negative subjects (2.0%). HIV positive children with advanced and severe immunosuppression had significantly higher intracellular parasites. HIV status did not significantly predict the overall risk of having extracellular intestinal parasites however, it was noted that *G. lamblia* infection was significantly higher in HIV positive children. HIV positive children had higher risk of having intracellular parasites especially if they have advanced or severe immunosuppression. Therefore, the policy of screening children for intestinal parasites should continue irrespective of their HIV status. Those that are HIV positive children should specifically be screened for intracellular parasites.

**Key words:** Intestinal parasites, HIV, Children, Prevalence, Immunosuppression

### INTRODUCTION

Intestinal parasitic infestations (IPI) are not uncommon in immunocompetent individuals. However, human

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immunodeficiency virus (HIV)-infected individuals with depleted immunity has an abnormally high susceptibility to infections with even minimally pathogenic organisms (Garcia et al., 1997). Globally about 40 million of people are infected with HIV/acquired immune deficiency syndrome (AIDS) including adults and children < 15 years, and out of this, about 2.5 million are children < 15 years. More than 90% of these infections are in sub-Saharan Africa.

Nigeria accounts for 30% of the global burden of mother-to-child transmission (MTCT) of HIV and 10% of Paediatric HIV/AIDS. HIV accounts for 3% of deaths in under-5 years children in Nigeria and most of the deaths are from opportunistic infections (World Health Organisation, 2007). Studies (Wiwanitkit, 2001; Sadraei et al., 2005; Cotte et al., 1993) have shown that there is an increased risk of opportunistic intestinal protozoans in HIV-infected than HIV-uninfected individuals. This is because HIV causes a progressive decline of the mucosal immunological defence mechanisms and alterations of production of IgA antibodies, thus increasing the susceptibility to various intracellular intestinal opportunistic agents, such as *Cryptosporidium parvum*, *Isospora belli* and *Microsporidium species* (Cimerman et al., 1999).

Children may suffer from other non-opportunistic extracellular intestinal parasitic infestations such as *Entamoeba histolytica*, *Giardia lamblia*, *Trichuris trichiura*, *Ascaris lumbricoides* and *Strongyloides stercoralis* (Sadraei et al., 2005). These enteric infections frequently cause severe diarrhoea especially in immunocompromised children than immunocompetent and sometimes lead to death (Cimerman et al., 1999). They also cause impairment of growth and development, reduce physical activity, impaired learning ability, recurrent abdominal pains, anaemia, intestinal obstruction, and under nutrition (Pensa et al., 2000; Kucik et al., 2004). Factors influencing the transmission of parasites are geographical and ecological conditions. Improper food processing also contributes to increase risks of parasitic infestations (Ikpeme et al., 1999).

HIV and IPI contribute to childhood morbidity and mortality in developing countries and therefore deserve a high degree of priority (Sadraei et al., 2005). It is estimated that approximately 70% of the disease burden on the whole population can be prevented in high prevalence communities by treating school children alone (Nematian et al., 2004). In Jos, Ibrahim (2004) found the prevalence of IPI in HIV infected adults with chronic diarrhoea as 20.8%. In view of the paucity of data on Paediatric HIV and IPI co-infection in this part of the country, the current study was undertaken to determine the prevalence and pattern of intestinal parasites (extracellular and intracellular) in HIV-infected and HIV-uninfected children and relate pattern of IPI to the severity of immunosuppression in HIV-infected children in

Jos University Teaching Hospital (JUTH), Jos, Plateau State.

## MATERIALS AND METHODS

### Study design

The study was cross-sectional involving HIV positive and HIV negative children.

### Study area

The study was carried out in Jos University Teaching Hospital (JUTH), a tertiary health institution. JUTH is located in Jos metropolis, the capital city of Plateau State, Nigeria. Plateau state has a size of 26,899 km<sup>2</sup>, with a population of 2,959,588 (Plateau State, 2009). It lies at latitude 9° 55' N and longitude 8° 53' E. The high lands rises from 1,200 m above sea level at the low lands to a peak of 1,829 m above sea level. It has a near temperate climate with an approximate mean high temperature of 22°C and mean low temperature of 18°C. The mean annual rainfall varies from 131.8 to 146 cm (Plateau State, 2009).

### Study population

All consecutively consenting patients aged 1 to 15 years, who have been confirmed HIV positive by polymerase chain reaction (PCR) or Western blot and were attending the Paediatric Infectious Disease Clinic of AIDS Prevention Initiative Nigeria (APIN), JUTH, were recruited as cases. Age and sex-matched children from Paediatric Out Patient Department (POPD), JUTH were used as controls. The controls were screened for HIV using rapid diagnostic kit (determine). The PCR was done with a commercially available kit for qualitative DNA polymerase chain reaction assay using Roche Amplicor HIV-1 DNA test, Version 1.5, manufactured by Roche Diagnostics, 9115 Hague Road Indianapolis, IN 46250-0457, USA. The Western blot kits were supplied by Immunetics Company, USA. Data obtained from the patients using structured questionnaire were age, sex, drug history, CD4 count/CD4%, family and social history and nutritional history including breastfeeding and use of breast milk substitute. A general physical examination was also carried out including the anthropometric measurements. Clinical staging was done using WHO clinical staging system (World Health Organisation, 2007). WHO HIV immunological staging using CD4% for children < 5 years and CD4 count for children > 5 years was done (World Health Organisation, 2007). The data were analysed with EpiInfo version 3.5.1.

### Laboratory sample collection and analyses

Blood samples were taken from the controls and tested for HIV-1 and 2 for recruitment into the study. Fresh stool samples were taken from all the study population and were examined for parasites using the following 3 methods: direct wet mount, formol-ether and modified Ziehl-Neelsen technique (Blacklock et al., 1973; Chessbrough, 1999). Those with positive parasites in their stool were treated accordingly except those with *Cryptosporidium*.

### Ethical considerations

Ethical approval was obtained from the Health Research Ethical Committee (HREC) of JUTH. Participation in the study was voluntary and written informed consent was obtained from all the parents/guardians. The information obtained from the study was kept confidential.

### Data analysis

The data was analysed using EpiInfo version 3.5.1. Student t-test, Wilcoxon two-sample test and analysis of variance (ANOVA) were used to compare means of variables while Chi square test was used for categorical variables. P-value < 0.05 was considered statistically significant.

## RESULTS

### Characteristics of study population

Five hundred and ten children aged 1 to 15 years were studied. Two hundred and fifty-five HIV positive children (mean age  $5.50 \pm 3.18$ ) and 255 HIV negative children ( $5.55 \pm 3.22$ ) were examined for intestinal parasitic infestations. The socio-demographic characteristics of the study population are presented in Table 1. There was no statistical significance in the sex, socioeconomic status and the mother's educational level in the 2 groups ( $p > 0.05$ ).

### Prevalence of intestinal parasitic infestations in HIV positive subjects and HIV negative controls

Seventy nine children had intestinal parasites, giving a prevalence rate of 15.5% in the study population, with 44 (8.6%) being HIV positive and 35 of them (6.9%) being HIV-negative children ( $p > 0.05$ ). Among the study groups, ages 1 to 5 years were 155 HIV positive children and 154 HIV negative children while in ages 6 to 10 years, there were 80 and 79 children, respectively. In ages 11 to 15, there were 21 children in each group. Fifty five (17.7%) in ages 1 to 5 years had IPI, 21 (13.0%) in ages 6 to 10 and 5 (11.6%) ages 11 to 15 had IPI. These differences did not show any statistical significance. Table 2 shows relative frequency of intestinal parasites in both groups. There was no significant difference statistically in the overall prevalence of extracellular parasites between the HIV positive and HIV negative children ( $p > 0.05$ ). The most prevalent extracellular parasite was *G. lamblia* with a prevalence rate of 5.9%. *G. lamblia* infection rate in HIV positive children (9.0%) was about three times that in HIV negative children (2.7%). This difference was statistically significant ( $p < 0.05$ ). The second commonest extracellular parasite was *E. histolytica* which was twice as common in HIV negative as in HIV positive ( $p < 0.05$ ). However, amongst the

HIV-negative children, the extracellular parasite most commonly isolated was *E. histolytica*. Fifteen (5.9%) HIV-positive subjects were infected with intracellular parasites (*Cryptosporidium* and *Isospora*). This was three times the infection rate of 2.0% in HIV-negative children ( $p < 0.05$ ). Seven (2.8%) and 2 (0.8%) of HIV positive and HIV negative children had multiple parasites, respectively ( $p > 0.05$ ).

### Stage of HIV disease and IPI

The prevalence of IPI (both extra and intracellular) was not statistically significant to the clinical stage of the disease ( $p > 0.05$ ). There was also no significant relationship between WHO clinical staging and acquisition of extracellular parasites. However, the frequency of intracellular intestinal parasitaemia tends to increase with clinical severity of disease. However, this was not statistically significant (Table 3). The prevalence of extracellular IPI did not vary with immunological status (Table 4). However, those with advanced and severe immunosuppression had a significantly higher prevalence of intracellular intestinal parasitic infestation than those with mild immunosuppression.

## DISCUSSION

The overall prevalence rate (15.5%) of intestinal parasites in this study is lower than previous studies carried out on children from other parts of Nigeria (Holland et al., 1989; Enekwechi et al., 1994; Agi, 1995). The prevalence in these areas ranged from (20.8 to 67.2%). The lower prevalence rates in this study could be due to the fact that Jos is at a higher altitude and as such it has a lower environmental temperature compared to other parts of Nigeria. This lower temperature (mean high temperature of 22°C and mean minimum low temperature of 18°C may not be favourable for the survival of larvae/ova of these parasites which require temperature of 24 to 37°C for optimal survival (WHO Technical Report series, 1991). Furthermore, the prevalence rate of 15.5% obtained in this study is lower than earlier findings reported from Jos (Zoakah et al., 1999; Ighoboja et al., 1997). This could be explained by the fact that the present study was a hospital based study and that could have affected the overall prevalence of IPI in the children studied. The other two previous studies were carried out in a rural community among malnourished children in Jos (Zoakah et al., 1999; Ighoboja et al., 1997; Ogbonna et al, 2004). Globally, the prevalence of IPI ranges between 20 to 90% which is higher than the overall prevalence in this study. The differences in prevalence rates in different parts of the world where the studies were carried out may be as a

**Table 1.** Socio-demographic characteristics of HIV positive and HIV negative children in Jos.

Parameter	HIV positive (n=255)	HIV negative (n=255)	Statistical test value	p value
<b>Mean age</b>	5.50±3.18	5.55±3.22	0.19 <sup>^</sup>	0.85
<b>Sex</b>				
Male	113 (44.3%)	116 (45.1%)	0.07 <sup>^^</sup>	0.78
Female	142 (55.7%)	139 (54.9%)		
<b>Social class</b>				
Lower	122	137	4.96 <sup>^^</sup>	0.08
Middle	98	98		
Upper	35	20		
<b>Maternal educational Status</b>				
No formal education	19	33	7.19 <sup>^^</sup>	0.07
Primary	48	45		
Secondary	100	110		
Tertiary	88	67		

<sup>^^</sup>chi square, <sup>^</sup> = T-test.

**Table 2.** Relative frequencies of intestinal parasites among children in Jos.

Intestinal parasite	HIV positive n (%)	HIV negative n (%)	Total (%)	$\chi^2$	P value
<i>A. lumbricoides</i>	1 (0.4)	3 (1.2)	4 (0.8)	0.25 (0.65)	-
<i>E. histolytica</i>	8 (3.1)	19 (7.5)	27 (5.3)	4.73 (0.03*)	-
<i>G. lamblia</i>	23 (9.0)	7 (2.7)	30 (5.9)	9.07 (0.003*)	-
<i>A. duodenale</i>	1 (0.4)	0(0)	1 (0.2)	0.00 (1.000)	-
<i>S. mansoni</i>	0 (0)	3 (1.2)	3 (0.6)	1.34 1.000	-
<i>Taenia spp</i>	0 (0)	1 (0.4)	1 (0.2)	0.00 (0.25)	-
<i>Cryptosporidium spp</i>	12 (4.7)	5 (2.0)	17 (3.3)	2.98 (0.08)	-
<i>Isospora spp</i>	3 (1.2)	0 (0)	3 (0.6)	1.34 (0.25)	-
<i>Cyclospora</i>	0 (0)	0 (0)	0 (0)	0.00 (0.00)	-
No parasites	214 (83.5)	219 (86.3)	433 (84.9)	-	-
Total	262	257	519	-	-

Some of the children had multiple parasites. Extracellular parasites- *E. histolytica*, *G. lamblia*, *A. lumbricoides* and *S. mansoni*, *A. duodenale* and *Taenia spp*; Intracellular parasites- *Cryptosporidium spp* and *Isospora belli*.

result of variations in study populations, methods, environmental and geographical factors (Whitefield, 1982).

This study shows that there is no significant difference in intestinal infestation amongst HIV positive and HIV negative children. This is similar to the report by Meamar

**Table 3.** Relationship between clinical staging and intestinal parasites among children in Jos.

Clinical Staging (WHO)	HIV positive	Extracellular parasite n (%)	Intracellular parasite n (%)
1	57	7(12.28)	2(3.51)
2	61	11(18.03)	4(6.56)
3	126	14(11.11)	8(6.35)
4	11	1(9.09) ( $\chi^2=8.89$ , p value=0.71)	1(9.09) ( $\chi^2=0.84$ , p value=0.84)

**Table 4.** Relationship between immune status and intestinal parasites among children in Jos.

Immunological staging (WHO)	HIV positive (N)	Extracellular parasite n (%)	Intracellular parasite n (%)
Not Significant	103	14 (13.6 )	2 (1.9)
Mild	70	10 (14.3 )	1 (1.4)
Advanced	40	4 (10.0)	5 (12.5)
Severe	42	5(12.0) ( $\chi^2=1.37$ , p value= 0.71)	7(16.7) ( $\chi^2=6.38$ , p value=0.04)

et al. (2007) which showed that the overall prevalence of intestinal parasites in HIV positive and HIV negative individuals were similar. Meamar et al. (2007) did not give a full description of the patients studied; however, the present study was carried out in HIV positive children who have been receiving care, treatment and support. That could have lowered the overall prevalence of IPI in these children. Mbae et al. (2013) in Kenya showed an overall prevalence of 25.6% in HIV positive versus HIV negative children < 5 years who had diarrhoea and were either being managed as outpatients or inpatients. A study in HIV positive and HIV negative patients conducted in Zaria, Nigeria by Inabo et al. (2012) showed a prevalence of 70.6% while Okodua et al. (2003) in Abeokuta, Nigeria showed an overall prevalence of 28.4% which are both higher than what was found in this study. Inabo (2012) and Okodua (2003) studies were conducted in adults with diarrhoea while Mbae (2013) study was on children with diarrhoea, and thus could have increased the parasite yield.

The prevalence rates of the extracellular parasites were similar in the HIV-infected and their age and sex-matched controls. In both groups, 33 of the 255 patients (12.9%) were infected with extracellular parasites. This was similar to studies by Lindo et al. (1998) and Meamar et al. (2007) who reported similar rates in both HIV infected and uninfected individuals studied. HIV-induced enteropathy does not favour the establishment of extracellular parasites (Lindo et al., 1998). Secondly, Th2 CD4 lymphocytes which are highly necessary to protect the host against such parasites remain less affected than Th1 in HIV seropositive patients (Meamar et al., 2007).

Even though extracellular parasite rates were similar in HIV positive and HIV negative, this study showed a significantly higher *G. lamblia* infection rate in HIV positive patients than HIV negative children. Okodua et al. (2003) in Abeokuta, Nigeria found a statistically higher infection with *G. lamblia* and *Cryptosporidium* in HIV positive compared to HIV negative individuals. Similarly, Babatunde et al. (2010) in Ilorin, Nigeria, found *G. lamblia* and *Strongyloides stercoralis* to be four times higher and *Cryptosporidium* to be five times higher in HIV positive compared to HIV negative adults, and these were related to level of immunosuppression. These findings were similar to this current study though the Okodua et al. (2003) and Babatunde et al. (2010) studies were conducted in adults. The relatively high prevalence rate of *G. lamblia* infection in HIV positive compared to HIV negative individuals could be as a result of depressed hosts' humoral immunity as observed by Robinson et al. (1990). Heavier parasites load of non-opportunistic parasite could also accumulate in HIV positive individuals who are severely immunocompromised as they may have delayed clearance of these parasites (Awole et al., 2003).

Meamar et al. (2007) in Iran did not find any difference in *G. lamblia* infection rate between HIV positive and HIV negative individuals. However, contrary to the present study, Lindo et al. (1998) reported a higher infection rate in HIV negative than HIV positive individuals. The difference in prevalence of *G. lamblia* infection between Lindo et al. (1998) study and that of Meamar et al. (2007), and the current could be because the study by Lindo et al. (1998) had a smaller sample size compared with the other two studies. The second commonest



extracellular parasite in this study was *E. histolytica* which was two times commoner in HIV negative than in HIV positive children and the difference was statistically significant. Lindo et al. (1998) had suggested that pathological changes in gut epithelium caused by HIV itself do not favour the extracellular parasites like *E. histolytica* to thrive well in HIV-infected persons. The prevalence rate of intracellular parasite was significantly higher in HIV positive than in HIV negative control. This is because intracellular parasites thrive when there is depressed T cell activity (Lindo et al., 1998; Farthing, 2003; Okodua, 2003; Inabo et al., 2012; Mbae et al., 2013).

*Isospora belli* was found exclusively in HIV positive children. This was consistent with the report of Meamar et al. (2007) in Iran. *I. belli* is an intracellular parasite which thrives when there is depressed T cell activity. However, the prevalence rate of *I. belli* in this study is lower than what was reported by Meamar et al. (2007) probably because most of the HIV positive children at PEPFAR, JUTH are routinely placed on cotrimoxazole for prophylaxis against pneumocystis jirovecii pneumonia (PCP). Cotrimoxazole has some activity against *I. belli* (Garcia, 1997; Johnson, 1997).

There was a significant relationship between immune status and intracellular parasitic infestation but there was no relationship between immune status and extracellular intestinal parasites. The fact that intracellular parasitic infestation occurred more in children with advanced and severe immunosuppression than mild immunosuppression is consistent with previous reports (Cimerman et al., 1999; Flynn, 2000). This can be explained by the nature of the immunological disturbances in HIV/AIDS patients in whom immune deficiency is most related to T-cell sub-populations and lymphokines. This is characterized by depletion of CD4 T-cells and compromised cellular immune response (Th1) that is considered protective against intracellular protozoan infection. On the other hand, clinical staging of HIV infection did not show any relationship with any particular parasite. This may be due to the fact that the parameters used in the clinical staging may not really increase the risk of having intestinal parasites as an HIV-infected child with clinical stage I may have severe immunosuppression.

There was no statistically significant difference in multiple parasitic infestations between the cases and controls. This finding differs from the earlier report by Hailemariam et al. (2004) in Ethiopia who found significantly higher multiple parasites among HIV positive children and adults than their controls. Though the Hailemariam et al. (2004) study was conducted in a tertiary health care centre like the present study, there was no indication as to whether the patients were on any form of care or treatment. However, the subjects in this

present study had already been recruited into a programme and they are cared for through health education, nutritional advice and supplement, treatment and prophylaxis of opportunistic infections and general advice on healthy living. These could have affected the actual prevalence observed.

The age group of 1 to 5 years was mostly affected with intestinal parasites, followed by 6 to 10 years. This age group preponderance is in contrast to some other reports (Ikpeme, 1999; Jalo, 1999; Johnson, 1997) which showed that most infestations occur at 6 to 12 years age category, followed by 1 to 5 years age group. This observation might be because children go to school much earlier now than before and as such, they are exposed to environmental factors much earlier. The drop in prevalence rates as the children approach adulthood could be due to increasing awareness of personal hygiene as the child grows. The sex distribution of intestinal parasitic infestation showed no significant discrimination in prevalence of infestation. This finding compares with a previous report (Jalo, 1999) but contradicts other reports which showed higher infestation rates in males than females (Ikpeme, 1999; Silverman et al, 1983). The lack of difference in infestation rates could be that both sexes were exposed to almost the same environmental conditions.

## Conclusion

HIV status did not significantly predict the overall risk of having extracellular intestinal parasites however, it was noted that *G. lamblia* infection was significantly higher in HIV positive children. HIV positive children had higher risk of having intracellular parasites especially if they have advanced or severe immunosuppression. Therefore, the policy of screening children for intestinal parasites should continue irrespective of their HIV status. Those that are HIV positive should specifically be screened for intracellular parasites.

This study has some limitations. In this study, only one stool sample was analysed and this could have affected the yield of intestinal parasites. Also, *Microsporidium* was not studied because of unavailability of the reagent. Most of the HIV positive patients in the Paediatric Infectious Disease Clinic have received some form of treatment, care and support prior to recruitment into the study. Therefore, this might have affected the prevalence and spectrum of intestinal parasites.

## Conflict of Interests

The author(s) have not declared any conflict of interests.

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*Full Length Research Paper*

# Opportunistic infections among human immune deficiency virus (HIV) positive injecting drug users of Dhaka City, Bangladesh

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**A descriptive cross sectional study was carried out among the 116 human immune deficiency virus (HIV) positive drug addicted people in Dhaka city during September, 2012 to March, 2013. The major objectives of this study were to assess the various spectra of opportunistic infections among drug users who are HIV positive for at least three years. Young adults are more frequent drug users and males are more prone to drug addiction as compared to females. Educational backgrounds of the HIV positive drug users were not satisfactory as most of them were illiterate or primary educated. Most of the male respondents were jobless, whereas most of the female respondents were sex workers. Majority of the drug addicts were low income earners. Infected respondents went to Mukta Akash program; an NGO based treatment and rehabilitation program when their infections got worse.**

**Key words:** Opportunistic infections, drug user, human immune deficiency virus (HIV), fungal infections, Mukta Akash.

## INTRODUCTION

Bangladesh is facing a rapidly growing human immune deficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) epidemic, in particular, among injecting drug users (IDUs). The first case of HIV/AIDS in Bangladesh was detected in 1989. Since then, 1495 cases of HIV/AIDS have been reported (as of December 2008) (IEDCR and ICDDR, 2011). However, United

Nations Programme on HIV/AIDS (UNAIDS) estimates that the number of people living with HIV in the country may be as high as 12,000, which is within the range of the low estimate by UNICEF's State of the World's Children Report 2009. The overall prevalence of HIV in Bangladesh is less than 1%; however, high levels of HIV infection have been found among IDUs (7% in one part of

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the capital city, Dhaka). It is estimated that without any intervention, the prevalence in the general adult population could be as high as 2% in 2012 and 8% by 2025. Due to the limited access to voluntary counselling and testing services, very few Bangladeshi's are aware of their HIV status. Although, still considered to be a low prevalence country, Bangladesh remains extremely vulnerable to an HIV epidemic, given its dire poverty, overpopulation, gender inequality and high levels of transactional sex. The emergence of a generalized HIV epidemic would be a disaster that poverty-stricken Bangladesh could ill-afford (IEDCR and ICDDR, 2011).

AIDS is an acquired immune deficiency syndrome caused by the HIV, which is spread through blood, semen, vaginal secretions and breast milk. The most common method of transmission is unprotected sexual intercourse with an HIV-positive partner. Other routes include transfusions of HIV-infected blood or blood products, tissue or organ transplants, use of contaminated needles and syringes (or other skin-piercing equipment), and mother-to-child transmission during pregnancy, birth or breastfeeding (Peter et al., 2002).

HIV is extremely fragile and cannot survive long outside the body's fluids or tissue, and it cannot penetrate unbroken skin. Therefore, HIV is not transmitted by casual physical contact with as kissing, holding hands, sneezing or coughing, sharing toilets, using the same eating utensils, or consuming food and beverages handled by someone with HIV. It is not spread by mosquitoes or other insects and can be killed with bleach, strong detergents, and hot water (International Labor Organization, 2001).

Like other developing countries, drug addiction has been increasing in Bangladesh in both urban and rural community (National Drug Demand Reduction Strategy, 1995; Rabbni, 1992). Crime, violence, poverty, sexual disease, inadequate health care facilities, etc., are all problems in Bangladesh. In addition to infliction of these difficulties, the entire society is now being afflicted by the drug addiction problem (Rabbni, 1992). Most of the drug addicts are young adults and the number is increasing with time (Danya, 1996; Morshed, 1996). Moreover, drug addicts are socially as well as religiously neglected. This has led to a state of degeneration.

HIV/AIDS has also been spreading all over the world; an alarming number of people have died of HIV/AIDS. There are some factors that make Bangladesh at risk of spreading HIV/AIDS, which are lack of knowledge on HIV/AIDS, social norms and taboos create obstacle to make the issue of HIV/AIDS open to all, especially to young generation, high prevalence of HIV infection in the neighboring countries, increased population movements both internal and external, increased number of sex workers (street/floating, brothel, hotel based) and high prevalence of STD, lower numbers of condom use; the sex workers have the lowest consistent condom use in Asia which is 2 to 4% only (4th National AIDS/STD Program Bangladesh, 2002). HIV infection is a devastating global

problem (Mann and Tarantola, 1998). More than 40 million people worldwide are now infected with HIV infection (Mohs et al., 1990) of which 90% are in the developing countries including South and Southeast Asia. HIV infection is rapidly spreading and India has 3.9 million people infected with the disease, country-wide probably, the largest number in the world. In Myanmar, more than half a million of its 45 million people have AIDS (Mann and Tarantola, 1998; Mohs et al., 1990; Geddes et al., 1998).

Drug addicts are at the highest risk of HIV infection, because of their prevalent immune nutritional deficiencies (Varela et al., 1997a, b) and behavioral risk factors (Islam et al., 2000; Choi et al., 2000). It has been documented that the largest number of AIDS cause in the developed countries occurs in intravenous drug users (IDUs) (Varela et al., 1997b; Strathdee et al., 1998). A cross sectional study was conducted among the floating drug addicted people and commercial sex workers in Dhaka city, and Bangladesh shows that 62% of drug users were mal-nourished (Huq et al., 2013). However, their knowledge about HIV/AIDS were of satisfactory level; about 85% of drug addicted people had knowledge on HIV/AIDS and 78% of the drug addicts had knowledge on route of transmission of HIV/AIDS (Huq et al., 2013). Again, non IDUs are also at increased risk for HIV infection due to unprotected sexual activity with HIV infected partners (Lehman et al., 1994). Different programs are for preventive and rehabilitative approach of intervention in case of HIV in IDU. The most vulnerable part of dealing with these patients is the opportunistic infections. With time, HIV patients develop varieties of opportunistic infections and at the end enter into the AIDS phase. These infections are not the same for all the age and social group of patients. As IDUs with HIV in our country are the most talked about group; their Oil States International Inc. (OIS) management is a prime concern for the policy maker. Many of the intervention programs have treatment and rehabilitation, as components of the package, yet proper planning is lacking.

## MATERIALS AND METHODS

### Study design

A cross sectional purposive study was carried out among 116 HIV positive injecting drug addicted people (male 95 and female 21) from the different parts of the Dhaka city during September, 2012 to March, 2013.

### Sample size calculation

A statistical method will be applied to determine the sample size by the following formula:

$$\text{Sample size } (n) = z_2(1-\alpha/2)pq/d = (1.96)^2 \times 0.23 \times 0.77 / (0.008) = 106.$$

where  $n$  = Desired sample size,  $Z$  = Standard normal deviate (it is usually set at 1.96 when  $CI=95\%$ ),  $\alpha$  = Level of significance,

**Table 1.** Comparison of the background information of the selected sex workers and drug users.

Parameter	Male		Female	
	Number	%	Number	%
<b>Age in years</b>				
15-29	19	20	3	14.29
≥ 30	76	80	18	85.71
Total	95	100	21	100
<b>Educational status</b>				
Illiterate	25	50.0	34	34.5
Primary	22	44.0	42	42.9
Up to SSC	3	6.0	22	22.6
HSC to graduation	9	9.47	-	-
Masters	2	2.10	-	-
Total	95	100.0	21	100.0
<b>Occupation</b>				
Jobless	22	23.16	3	14.29
Rickshaw puller	19	20	-	-
Day labor	13	13.68	-	-
Student	21	22.11	-	-
Businessman	12	12.64	-	-
Job holder	8	8.42	-	-
Housewife	-	-	7	33.33
Sex worker	-	-	-	52.38
Total	95	100.0	21	100.0

P=Anticipated population proportion (23%), q=(1-p), d=Allowable error (8%), with 10% non response and the total sample size of 116.

#### Development of questionnaire

A semi-structure questionnaire was developed containing both closed and open question in accordance with the study objectives to obtain relevant information such as socio-demographic conditions, anthropometrical, drugs and sexual lifestyle, HIV/AIDS related information, etc. All questions were designed, pretested, modified and resettled to obtain and record information easily. Any modification necessary were then made and a final recoded, pretested questionnaire was drawn up.

#### Anthropometric assessment

The anthropometric data were collected based on standard methods. Age of the subjects under study was determined by interrogation and confirmed through probing national identity card. Measurements of weight and height were obtained from all subjects. The subjects were weighed wearing minimal cloths and bare footed. Three weight measurements were obtained using a bathroom weighing scale and the average was calculated and recorded to the nearest 0.5 kg. The height was measured with a wooden measuring board without shoes and the average was calculated and recorded to the nearest 0.1 cm. Body mass index

(BMI) is the best method of measuring the nutritional status of the respondent.

$$BMI = \frac{\text{Weight in kg}}{\text{Height in m}^2}$$

#### Data analysis

The data set were first checked, cleaned and entered into the computer from the numerical codes on the form. The data was edited if there is any discrepancy and then was cleaned. The frequency distributions of the entire variables were checked by using SPSS 20.0 windows program. For tabular, charts and graphical representation Microsoft word and Microsoft excel were used.

## RESULTS AND DISCUSSION

HIV/AIDS and drug addiction severely affects the human life. It affects physical, mental, social and professional well being of an individual as well as social. So, it is being addressed as national, social and health problem in Bangladesh. Table 1 shows the distribution of the respondents by age and sex. 20% male and 14.29%

**Table 2.** Distribution of the respondent based on their monthly income.

Income group (Tk.*)	Number	%
Less than 5000	42	36.21
5000-10,000	37	31.90
10,000-20,000	21	18.10
>20,000	16	13.79

\*1\$=78 Tk at December 2012.

**Table 3.** Distribution of the respondents based on injecting drug use.

Age group	Male		Female	
	Number	%	Number	%
≤ 5 years	2	2.11	10	47.62
≥ 5 years	93	97.89	11	52.39
Total	95	100.0	21	100.0
<b>Respondents on taking ART</b>				
Yes	34	35.79	5	23.81
No	61	64.21	16	76.19
Total	95	100	21	100
<b>Disease</b>				
Abass/Cellulites	42	44.21	-	-
Skin infection (Fungal, Scabies)	17	17.89	10	47.62
Tuberculosis (Pulmonary TB meningities, Lymphnode, Disseminated)	8	8.41	7	33.33
Pulmonary infection	5	5.26	4	19.05
Sepsis	15	15.79	-	-
Candidacies ( Oral, Vulroraginal)	2	2.11	-	-
Malignancy	3	3.16	-	-
Shigellosis	3	3.16	-	-
Total	95	100.0	21	100.0

female drug addicts were 15 to 29 years age group. About 80% male and 85.71% female drug addicts were found in the age group ≥ 30 years. About 4.22% of male and 90.48% of female drug addicts were illiterate. 63.16% male and only 9.52% female passed through primary classes. 21.05% male were up to Secondary School Certificate (SSC), whereas male of Higher Secondary Certificate (HSC) to graduation and Masters were 9.47 and 2.10%, respectively. It has also been observed that the occupation of drug addicts where 76.84% male and 85.71% female were found to have job whereas 23.16% male and 14.29% female were jobless. 20% male were rickshaw puller, whereas only 13.68% male were day laborer, 22.11% male were students, 12.64% male were businessman, 8.42% male were job holder. On the other hand, 33.33% female were housewife and 52.38% were sex worker.

Table 2 shows that 36.21% of the drug addicts were found in less than Tk. 5000 income group. 31.90% drug addicts had income within Tk. 5000 to 10000, whereas 18.10 and 13.79% drug addicts were found in Tk. 10000

to 20000 and greater than Tk. 20000 income group, respectively.

Table 3 shows that 2.11% male and 47.62% female respondent IDUs were ≤5 years age group, whereas 97.89% male and 52.39% female respondents were ≥5 years age group. This table also shows that 35.79% male and 23.81% female respondents were taking anti retroviral therapy (ART), whereas 64.21% male and 76.19% female respondents were not taking ART. HIV infection is rapidly spreading. Because of their prevalent immune nutritional deficiencies and behavioral risk factors, drug addicts are at the highest risk of HIV infection and 44.21% male respondents were infected by abass or cellulites. About 17.89% male and 47.62% female respondents were infected by skin infection (fungal and scabies). 8.41% male and 33.33% female respondents were infected with tuberculosis. 5.26% male and 19.05% female respondents were infected by pulmonary infection. 15.79, 2.11, 3.16 and 3.16% of male respondents were infected by sepsis, candidacies, malignancy and shigellosis, respectively.

**Table 4.** Years from which respondent got to know about HIV after starting drugs addiction.

Year	Number	%
1	41	35.35
1-3	75	64.65
Total	116	100.0

**Table 5.** Distribution of the respondents by their treatment.

Place of treatment	Frequency	Percentage
In the program	90	77.58
Other hospital	15	12.93
Pharmacy	11	9.48
Total	100	100.0
<b>Taking proper courses</b>		
Yes	73	62.93
No	43	37.67
Total	100	100.0
<b>Knowledge on OI</b>		
Yes	82	70.69
No	34	29.31
Total	100	100.0

Table 4 shows that 35.35 and 64.65% respondents got to know about HIV after 1 and 1 to 3 years of starting drugs addiction, respectively. Table 5 shows that the largest number (77.58%) of the respondents went for treatment of infectious disease in the program, 12.93% went in other hospital and 9.48% went in pharmacy.

Among them, 62.93% of the respondents took proper courses for treatment, but 37.67% respondents did not take any proper treatment, whereas 70.69% of the respondents were known about the opportunistic infection, but 39.31% did not hear about the opportunistic infection.

## Conclusion

The main objective of this study was to assess the opportunistic infections among HIV positive injecting drug addicts. In this study, among the injecting drug addicts of aged above 30 years and mostly were in primary level. Income plays an important role in drug addicts and found mid income (below 5000 taka) people, who faced the social inform to be mostly affected by drug addiction. High risky behavior that has been practiced is not decreasing and still exists among HIV patients. Though, the HIV/AIDS transmission among the high risk groups is still lower, but their risky behavior may reach towards an

epidemic. So, the high risky behavior on HIV transmission that has prevailed among the addicted and sex workers should be reduced at any cost to prevent the spread of HIV/AIDS. Intravenous drug users and sex workers play a major role in spreading HIV/AIDS in Bangladesh. From the earlier mentioned study, it becomes clear that the HIV transmission rate is very high among those with high risk group population in Bangladesh. The picture obtained in this study on HIV transmission is undoubtedly alarming. Only community is not enough for the addicted people, they must get proper treatment and rehabilitation. To achieve this goal, both governmental and NGOs have to work together. It is really painful that 70% of the addicted people do not know whether they become addicted again after getting treatment from drugs rehabilitation center. In this connection, Government of Bangladesh (GOB) and NGOs play an important role to give them proper treatment and motivation. Not only the institution, but also their families also have to play an important role improving proper care to them. In Bangladesh, more than half of the addicted people share needle/syringe and most of the sex workers take unprotected sex, still HIV transmission rate is low, but it is obvious that if such risky behavior continues, then the HIV transmission rate will increase among the addicted people, sex workers and also in general population resulting in horrible scenario. So, it is a matter of concern of the nation as well as at the social, political and economic level.

## Conflict of Interests

The author(s) have not declared any conflict of interest.

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