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Figure legends should be typed in numerical order on a separate sheet. Graphics should be prepared using applications capable of generating high resolution GIF, TIFF, JPEG or Powerpoint before pasting in the Microsoft Word manuscript file. Tables should be prepared in Microsoft Word. Use Arabic numerals to designate figures and upper case letters for their parts (Figure 1). Begin each legend with a title and include sufficient description so that the figure is understandable without reading the text of the manuscript. Information given in legends should not be repeated in the text.

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Abayomi (2000), Agindotan et al. (2003), (Kelebeni, 1983), (Usman and Smith, 1992), (Chege, 1998; 1987a,b; Tijani, 1993,1995), (Kumasi et al., 2001)
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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.

Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

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Journal of AIDS and HIV Research

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Full Length Research Paper

Autonomic dysfunction as a predictor of heart disease in human immunodeficiency virus (HIV)

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The purpose of this study was to test the presence of Autonomic Dysfunction (AD) in patients infected with Human Immunodeficiency Virus (HIV). 30 HIV (study) and non HIV (control) patients were prospectively enrolled and underwent five different established methods for detection of autonomic dysfunction. Amongst the five tests employed, there was a statistical difference in 4/5 tests between the two groups. The HIV patients studied had a statistically lower initial resting heart rate than the control group. The data shows that after 15 s, the resting heart rate was still significantly lower in the HIV group ($p = 0.01$) with no significant difference ($p = 0.73$) by 30 s. The ratio of the 30 to 15 s measurements suggests a substantial and highly significant ($p < 0.0001$) difference between the groups. In comparing the two groups with respect to a 2 min standing blood pressure difference, Diastolic blood pressure (DBP) was significantly different between the groups. In the exercise test, both group and the time factors were significant; the former at $p < 0.0001$ and the latter at $p = 0.0001$. There were significant differences of all blood pressure parameters during maximum exercise and recovery, with $p < 0.0001$ for all comparisons of the group factor. In the valsalva maneuver test, there was a statistical difference between the two groups during the longest r-r interval. Moreover, in the HIV group, there were more abnormal responses but these were not statistically significant. The relationship between HIV infection and cardiovascular disease is significant; this study aimed to show that HIV does affect the autonomic nervous system. The study demonstrates the high prevalence of autonomic dysfunction in HIV infected patients and the lack of correlation with markers of disease severity or disease duration. The patients studied showed an abnormal response to most tests employed (4/5).

Key words: Autonomic dysfunction, human immunodeficiency virus (HIV), acquired immune deficiency syndrome (AIDS), nervous system, cardiovascular system.

INTRODUCTION

According to current estimates, approximately forty million people worldwide are infected with the Human immunodeficiency virus (HIV). While attention in recent years has focused on the HIV epidemic in Africa and parts of Asia, HIV continues to have a substantial effect in the United States. The Centers for Disease Control (CDC) recently increased the estimated number of HIV infected individuals living in the U.S. to above 1 million persons, and it is estimated that 40,000 individuals acquire HIV infection each year in the U.S (CDC, 2008).

The consequences of the HIV epidemic have been significant in Newark, New Jersey's largest city. The known HIV/AIDS (Acquired immune deficiency syndrome) rate

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is higher in Newark (2,035 per 100,000 persons) than the entire state of NJ (358 per 100,000), and is among the highest in the United States (CDC, 2008). Now, in the third decade of the HIV epidemic in Newark, the effects have been devastating on the minority populations that inhabit Newark with 1/32 African Americans and 1/86 Latinos living with HIV/AIDS (NJ Department Health, 2004).

Despite a declining rate of HIV related death, proportions of HIV infected patients dying of other causes have increased (Krentz et al., 2005). As an example, a death certificate study in New York City showed that the proportion of deaths among HIV-infected patients due to non-HIV related causes increased from 19.8 to 26.3% between 1999 and 2006, reflecting mortality resulting from cardiovascular disease (CVD), substance abuse, and non-AIDS defining cancers (Sackoff et al., 2006). Among individuals aged 55 years or older, CVD was the leading cause of death. There are several health consequences to patients infected with HIV. The relationship between HIV infection and cardiovascular disease is significant, and has been the subject of several investigations.

There are a number of distinctive neuropathic syndromes which can be classified according to the timing of their appearance during HIV infection, etiology and whether they are primarily axonal or demyelinating (Keswani et al., 2002; Markarian et al., 1998; Brinley et al., 2001; De la Monte et al., 1988; Mcarthur et al., 2005; Verma et al., 2001; Ferrari et al., 2006). These include: distal symmetric polyneuropathy, mononeuropathy multiplex, acquired inflammatory demyelinating polyradiculoneuropathy, cauda equina syndrome (or lumbosacral polyradiculopathy), diffuse infiltrative lymphocytosis syndrome (DILS), autonomic neuropathy, mononeuropathies, herpes zoster radiculitis and sensory ganglioneuritis.

Autonomic dysfunction is one of these relationships, and its serious health hazard of postural hypotension, syncope and pre-syncope as well as cardiopulmonary arrest during invasive procedure has been reported (Prendergast, 2003). Autonomic dysfunction is more pronounced with AIDS patients; however it has been reported in patients with HIV infection without AIDS (Sakhuja et al., 2007; Divine et al., 2002).

The term autonomic nervous system (ANS) describes nerves that are concerned predominantly with the regulation of bodily functions. It is comprised of sympathetic and parasympathetic nerves, and their function is complementary (Stojanovich et al., 2009). Autonomic failure is a disorder of noradrenergic neurotransmission in which postganglionic sympathetic neurons do not release norepinephrine appropriately. This low norepinephrine release results in impaired vasoconstriction leading to secondary reduced intravascular volume, both of which contribute to orthostatic hypotension. In normal subjects, as the blood pressure falls, there is an appropriate reflex-induced increase in heart rate; however, the presence of a heart rate increase does not exclude autonomic failure. Conversely, heart rate usually decreases during reflex syncope (Kaufmann et al., 1997).

MATERIALS AND METHODS

Over the course of two years, 30 HIV infected patients were prospectively enrolled. Simultaneously, 30 volunteers were matched for age, gender, ethnicity and medical conditions and recruited. Institutional review board approval was obtained for the study. Informed consent was obtained from each subject. The exclusion criteria for enrollment were: Age < 18 and > 80 years, hospitalized patients, patients with the diagnosis of Diabetes mellitus (DM) on or off therapy, patients with fasting blood glucose (FBG) > 120, alcoholic patients, patients in active drug withdrawal (heroin, cocaine, tobacco, active drug use (last 24 h), active tuberculosis (TB) or on TB therapy, adrenal insufficiency, any history of neuropathy and any history of a neurological disorder. In addition, adherence to published recommendation by The American College of Cardiology (ACC) on absolute and relative contra-indication to performing exercise testing was observed: Alcoholic patients, acute myocardial infarction (within 2 days), high-risk unstable angina, uncontrolled cardiac arrhythmias causing symptoms or hemodynamic compromise, symptomatic severe aortic stenosis, uncontrolled symptomatic heart failure, acute pulmonary embolus or pulmonary infarction, acute myocarditis or pericarditis, acute aortic dissection, left main coronary stenosis, moderate stenotic valvular heart disease, electrolyte abnormalities, severe arterial hypertension, tachyarrhythmias or bradyarrhythmias, hypertrophic cardiomyopathy and other forms of outflow-tract obstruction, mental or physical impairment leading to inability to exercise adequately and high-degree atrioventricular block.

The different baseline characteristics were directly obtained from the study subjects. None of the study subjects consumed caffeine prior to starting the study tests. All of the patients underwent the study in the same room using the same equipment for all of the patients. In addition, the temperature in the room was adequate for the tests and was the same for all of the patients. Individuals who met the study requirements performed an exact sequence of different non invasive maneuvers to evaluate their autonomic system. The sequence of maneuvers performed was as follows:

1. Six breath per minute test;
2. Valsalva maneuver with the subject achieving a 40 mmHg pneumotic pressure for 15 s with subsequent two minute standing and measurement of blood pressure and heart rate;
3. Five minute hand grip test with the subject holding at thirty percent pressure of their maximum hand grip pressure;
4. Exercise stress test performed using the standard Bruce protocol.

Statistical methods

Continuous (interval) data were evaluated for fit-to-normality by the D'Agostino-Pearson omnibus normality test. All data were found to fit normal distributions to a statistically significant degree. Thus, parametric methods were used throughout. Two group-wise comparisons with one independent variable were made by t-tests; when more than one independent variable was to be compared;

Table 1. The base line demographic characteristics between the study (HIV) and control.

Characteristics	HIV group	Control group	P-value
Age	45.4± 8.1	46.6± 10.5	0.585
Gender (m/f)	20/10	20/10	1.000
Race/Ethnicity:			
Black	26	20	
White	1	2	
Hispanic	3	8	
Hypertension (y/n)	3/27	8/22	0.181
Coronary artery disease (y/n)	0/30	0/30	1.000
COPD (y/n)	7/23	1/29	0.052
Neoplasm (y/n)	0/30	0/30	1.000
Neurological disease (y/n)	0/30	0/30	1.000
Smoking (y/n)	15/15	2/28	0.001
Alcohol use (y/n)	11/19	0/30	<0.001
Drug use (y/n)	0/30	0/30	1.000

y = yes, n = no, m = male, f = female

two-way Analysis of variance (ANOVA) was used in a 2 × 4 factor analysis as follows: study groups were treated as an independently assorted variable and clinical maneuver times of measurement (resting, 1, 3 and 5 min for the exercise maneuver, resting and 2 min for the standing maneuver and maximum exercise, 1 and 5 min post exercise for the exercise recovery study) were repeated measures. Categorical variables were compared by contingency table cross-tabulations; 2 × 2 comparisons tested for statistical significance by Fisher's exact test and 2 × 3 comparisons by the chi-square test using Yates' correction. Statistical significance was based on $\alpha = 0.05$, that is $p \leq 0.05$ was considered to be statistically significant. The magnitude of effect is given as the relative risk (RR) with 95% confidence intervals (95% CI) provided. All statistical computations were made with a personal computer using Prism® software (GraphPad Corp., San Diego, CA USA).

RESULTS

The HIV patients studied had a statistically lower initial resting heart rate than the control group. The HR was also evaluated using measurements of the R-R at 15 s, slight differences were observed with regard to resting blood pressure (BP), with the HIV group having slightly lower systolic blood pressure (SBP). The results of the valsalva maneuver on the R-R interval measured at 15 s of standardized valsalva failed to show statistical significance as a parameter of autonomic dysfunction in the study, the same was also noted upon measuring the blood pressure after five minute of hand grip exercise, the p-value for this test was also insignificant between the HIV group and the control group. Finally, during the stress test recovery phase, 18/30 (60%) had a delayed recovery to baseline heart rate.

In evaluation of background information, there was significant difference observed with regard to alcohol use, with significantly greater respondents in the HIV group (36.7%) claiming alcohol use and none in the control group. The HIV group also had substantially higher prevalence of Chronic obstructive pulmonary disease (COPD) (23.3%) than the control group (3.33%); however this difference did not quite achieve statistical significance (Table 1).

The baseline hemodynamic data [SBP, diastolic blood pressure (DBP) and mean arterial pressure (MAP)] showed a difference between the two groups. The HIV group had a statistically lower initial resting heart rate than the control group. The HR was also evaluated using measurements of the R-R at 15 and 30 s obtained by Electrocardiography (ECG) (Figure 1). These data suggest that after 15 s, the resting heart rate is still significantly lower in the HIV group ($p = 0.01$) with no significant difference ($p = 0.73$) by 30 s. The ratio of the 30 to 15 s measurements suggests a substantial and highly significant ($p < 0.0001$) difference between the groups. Slight differences were observed with regard to resting BP, with the HIV group having slightly lower SBP ($p = 0.32$) and slightly higher DBP ($p = 0.21$). The resultant MAP means were nearly identical ($p = 0.96$) (Figure 2). When comparing the hemodynamic data (SBP, DBP and MAP) with respect to a 2 min standing maneuver, only DBP was significantly different between the groups. There were no significant differences in the time factors for any of the three comparisons (Figure 3).

The results of the means of the HR measurements for the exercise and post-exercise recovery period showed a

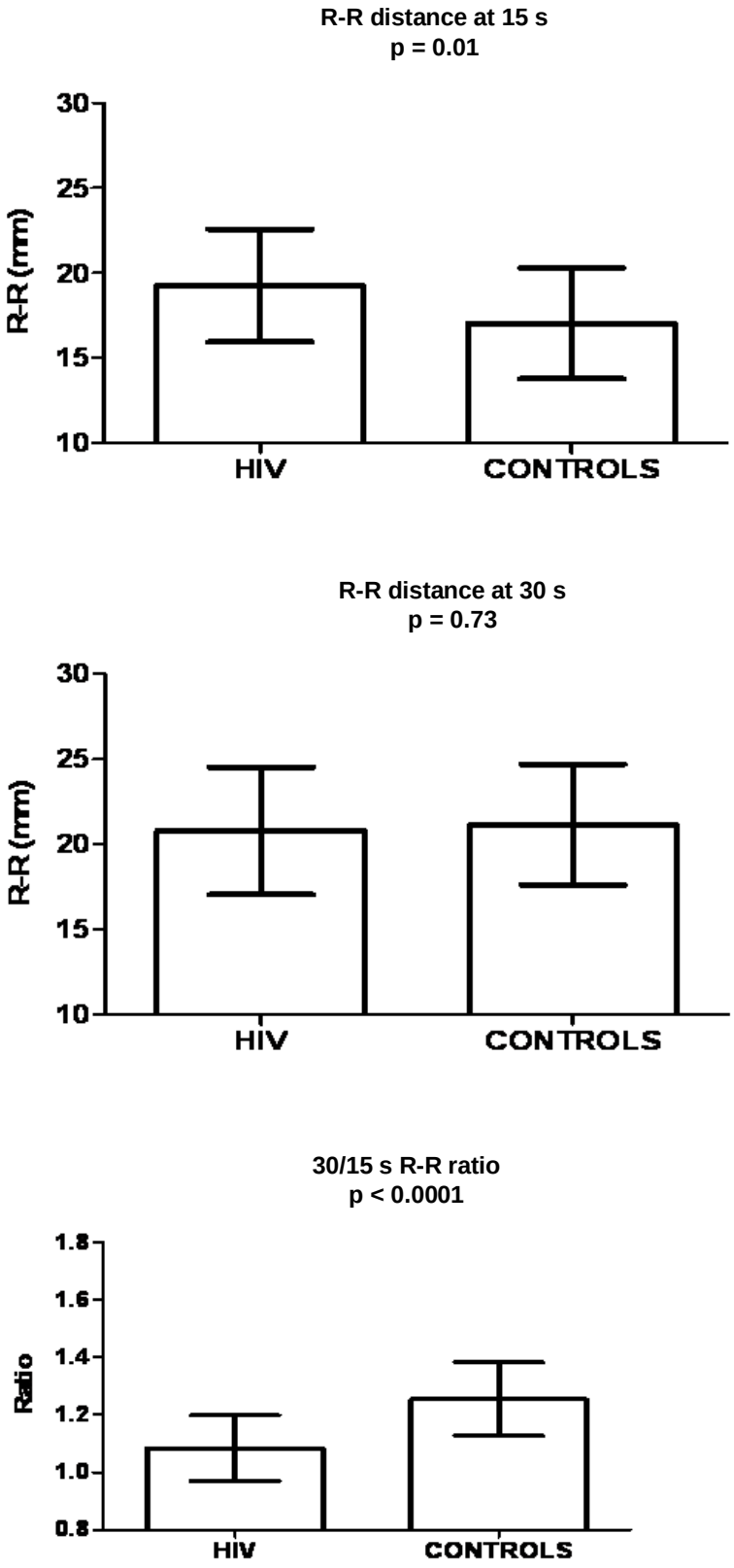

Figure 1. Heart rate (HR) measurements calculated for R-R at 15 s and R-R at 30 s on the electrocardiogram.

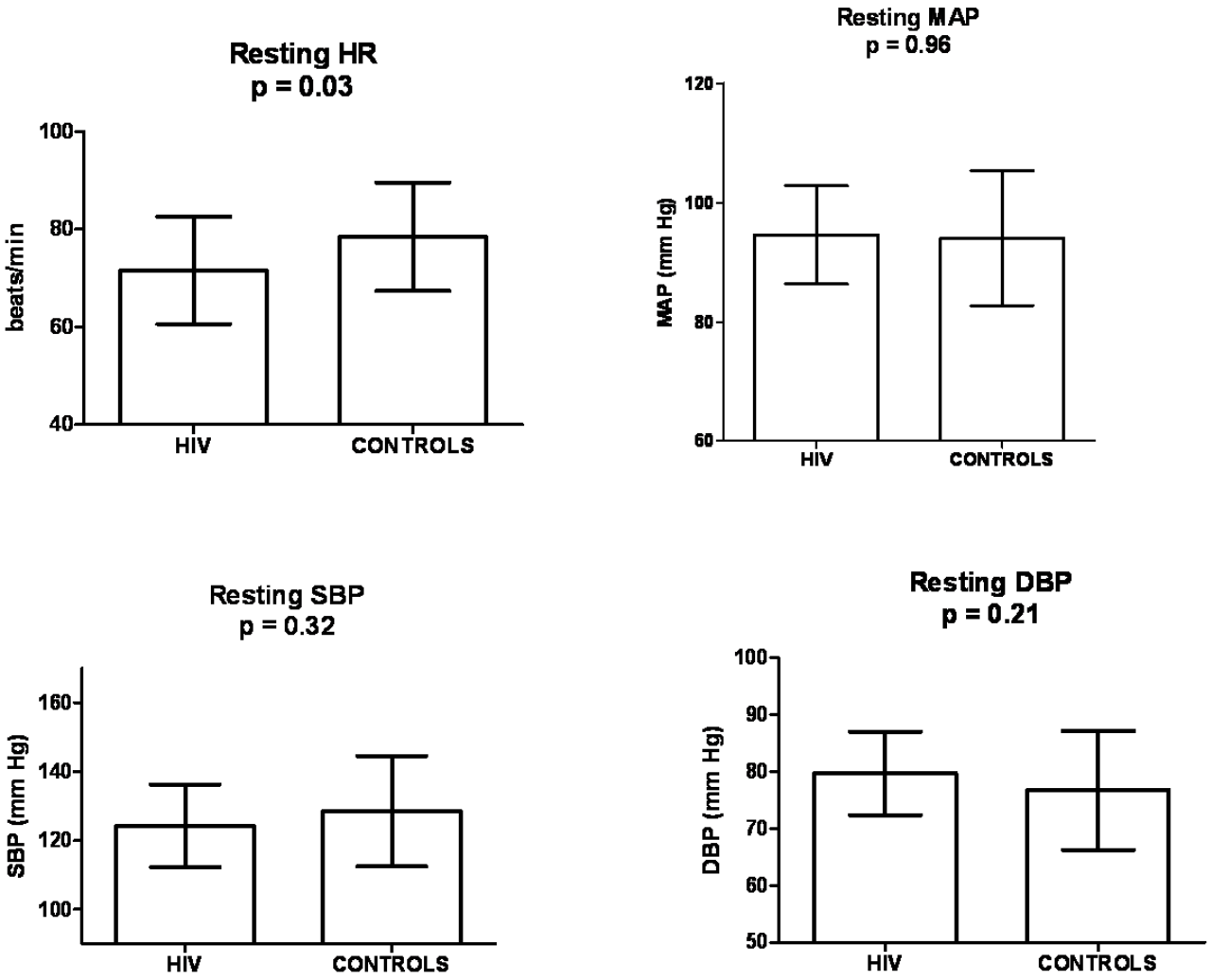

Figure 2. Initial measurements of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP).

significant difference between the two groups. Both groups and the time factors were significant; the former at $p < 0.0001$ and the latter at $p = 0.0001$. There was also a significant interaction between the two factors with the p-value for interaction of 0.035. There were significant differences of all blood pressure parameters during maximum exercise and recovery. These data are presented in Figure 4, showing highly significant group-wise differences, with $p < 0.0001$ for all comparisons of the group factor. Finally, during the stress test recovery phase, 18/30 (60%) of the HIV had a delayed recovery to baseline heart rate (Figure 5).

The valsalva maneuver's effect on the R-R interval between the two groups was also tested as part of the experiment, however, it did not yield a significant difference. The longest/shortest (L/S) R-R distance ratio did not quite achieve statistical significance. In order to demonstrate the actual number of studies falling below the established cut-off of 1.2, the L/S ratio values are shown as dot histogram (means and SD given by lines) with a dotted line at the cut-off. A contingency table analysis comparing those below and above the cut-off for each group suggests that the valsalva maneuver data are not statistically significant with 16.7% of the HIV group and 13.3% of the control group below 1.2 ($p = 1.00$) (Figure 6).

Finally, the hand grip's effect on DDBP was tested and the results did not yield any difference between the two groups. Neither the group-wise differences with DDBP as a continuous variable nor the categorization of the data into those subjects > 16/ ≤ 16 mmHg were statistically significant; the former: $p = 0.55$; the latter: $p = 1.00$

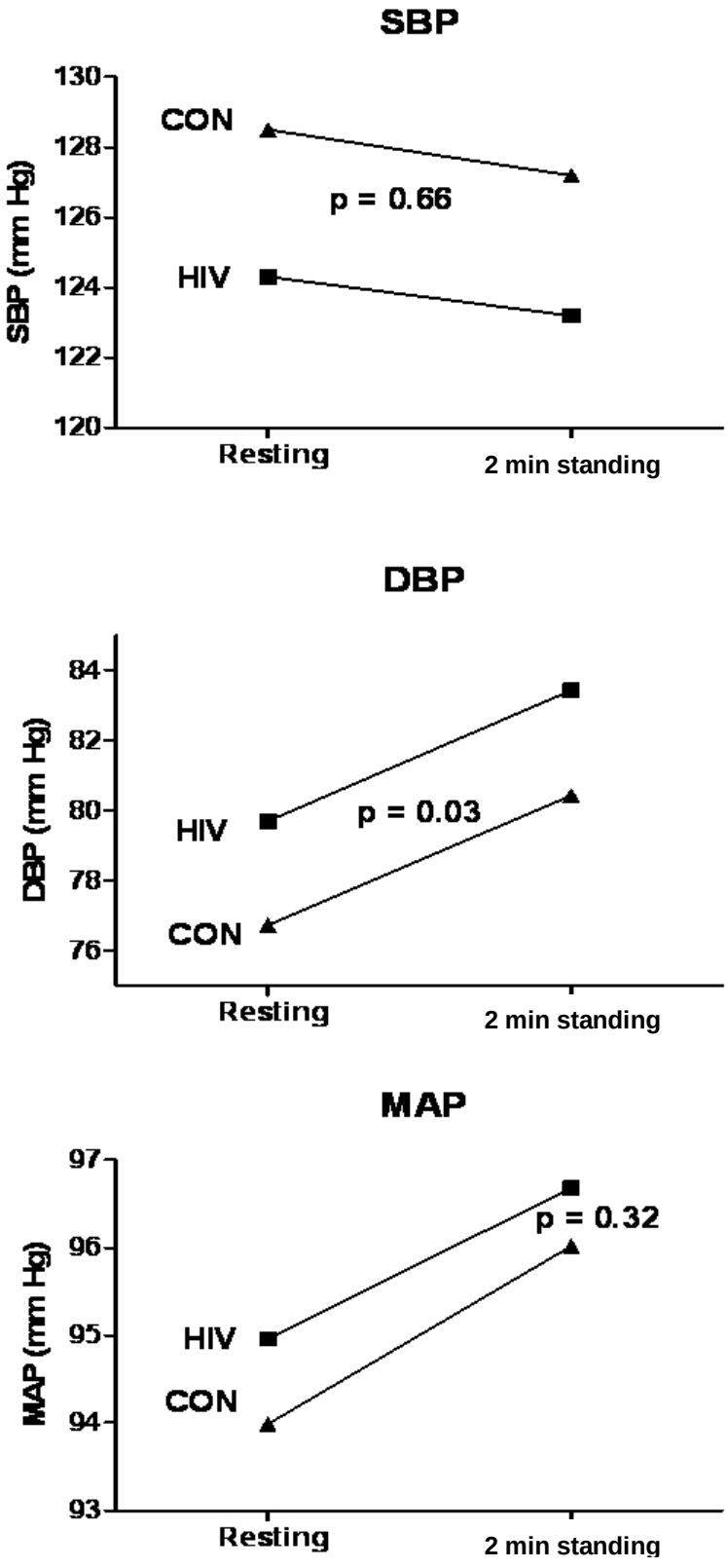

Figure 3. Factorial results of a 2 min standing maneuver upon systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP). CON = control.

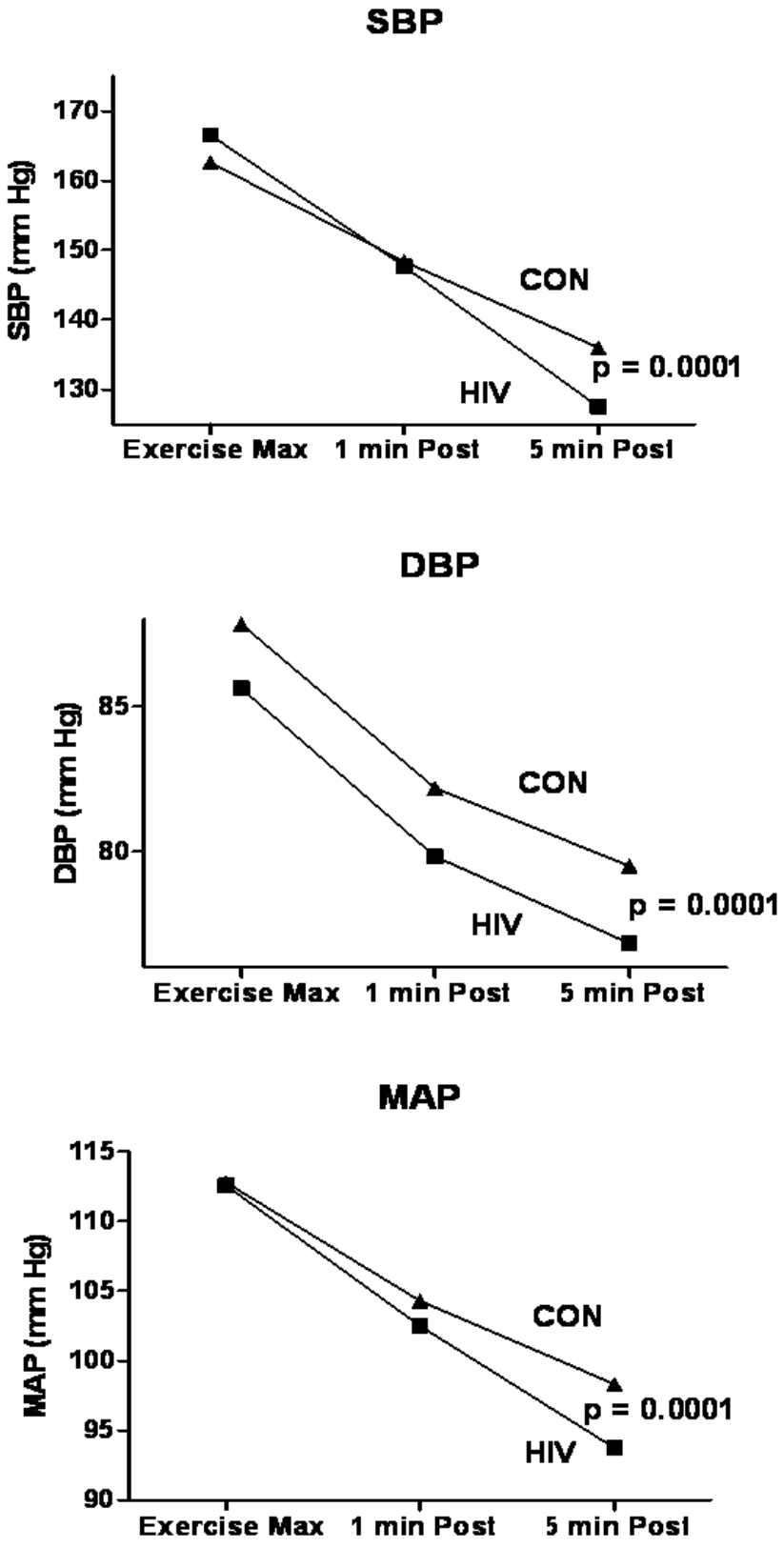

Figure 4. The maximum exercise and recovery systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP). CON = control.

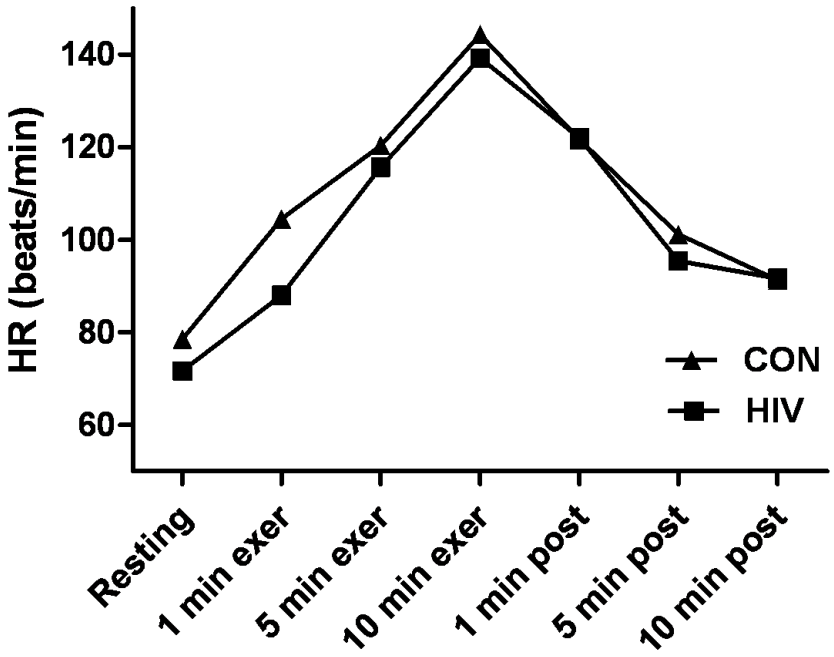

Figure 5. Means of the heart rate (HR) measurement for exercise and for the post exercise recovery period. CON = control.

(Figure 7).

DISCUSSION

The interest of this project was to study the autonomic dysfunction (AD) in HIV infected patients. Although there are multiple studies that have shown that HIV infected patients have AD, none have utilized the exercise stress test. There are several methods that can be employed for defining AD in HIV. These include but are not limited to blood pressure response and heart rate variability (Divine et al., 2002). The presence of AD was prospectively studied in thirty HIV infected patients using the previous reported methods (Divine et al., 2002). The results of this group were compared to a matched control group of non HIV patients.

This study investigated the presence of autonomic dysfunction in HIV infected patients in comparison to non HIV infected patients. The data shows that in evaluation of base line heart rate, the HIV group had a statistically lower initial resting heart rate than the control group. Secondly, the HR was also evaluated using measurements of the R-R at 15 and 30 s as obtained by ECG (Figure 1). These data suggest that after 15 s, the resting heart rate is still significantly lower in the HIV group ($p = 0.01$) with no significant difference ($p = 0.73$) by 30 s. The ratio of the 30 to 15 s measurements suggests a substantial and highly significant ($p < 0.0001$) difference between the groups. In comparing the two groups with respect to a 2 min standing blood pressure difference, DBP was significantly different between the groups.

In the exercise test, both group and the time factors were significant; the former at $p < 0.0001$ and the latter at $p = 0.0001$. There was also a significant interaction between the two factors with the p- value for interaction of 0.035. There were significant differences of all blood pressure parameters during maximum exercise and recovery. These data are presented in Figure 4, showing highly significant group-wise differences, with $p < 0.0001$ for all comparisons of the group factor. In the valsalva maneuver test, there was a statistical difference between the two groups during the longest R-R interval. Moreover, in the HIV group there were more abnormal responses but they were not statistically significant. The lack of statistical significance on this test may be a result of a small sample size. Overall, in comparing HIV versus non HIV infected patients, there was a significant difference between the two groups on 4 out of the 5 tests employed.

The data supports the notion that there exists a difference in autonomic function between HIV patients and controls. The positivity to multiple autonomic parameters in patients that have a low CD4 count as well as in patients with a good CD4 count indicates that the autonomic dysfunction exists independent of disease

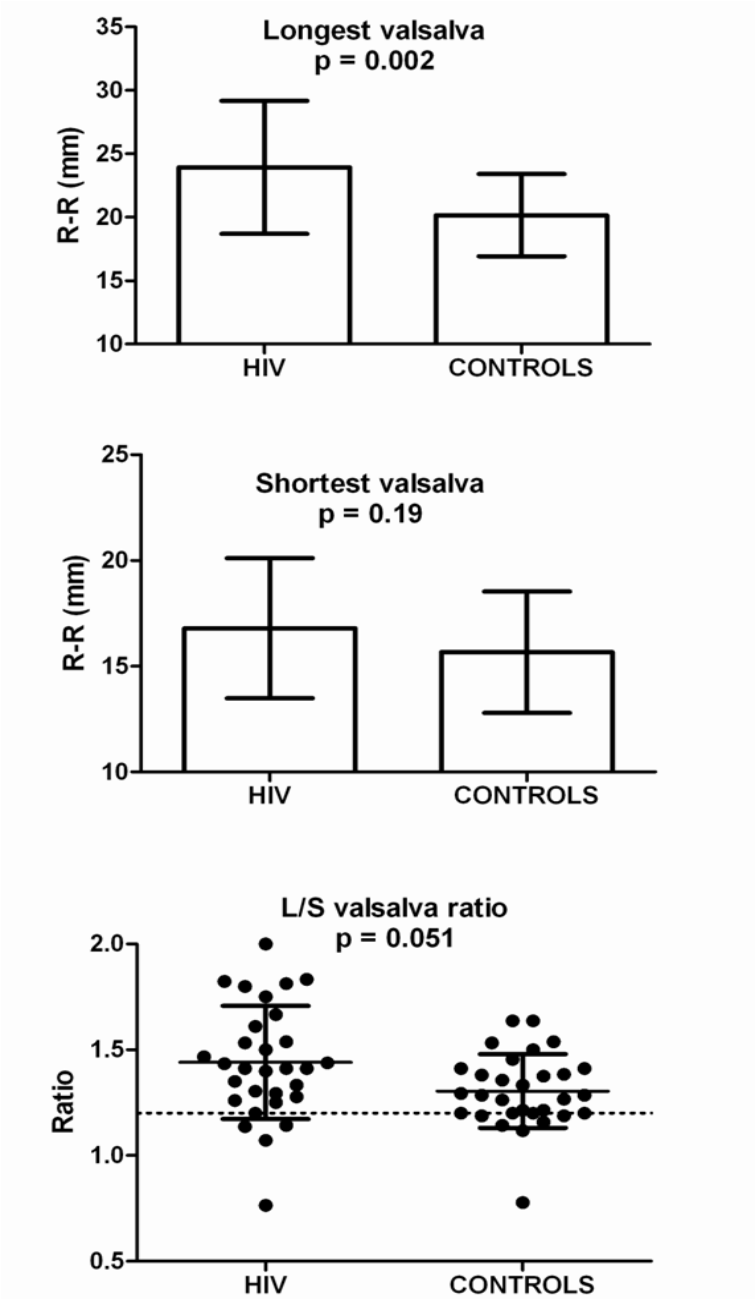

Figure 6. The results of the valsalva maneuver on the R-R interval are shown with the bar histograms giving the longest and the shortest R-R intervals.

severity. However, most of the patients (87%) in the study did not have AIDS, and thus this may have limited drawing a proportionality relationship between CD4 count and test response. There was no correlation between the number of positive tests and the CD4 count viral load for years, since diagnosis or the use of antiretroviral therapy.

Amongst the parameters tested, beat-to-beat heart rate variation seems to have yielded the greatest number of abnormal responses, while measuring systolic blood pressure in response to standing yielded the least number of abnormal responses. The limitation to the study is the small sample size in both groups; however, the data supports the presence of an abnormal autonomic response to the multiple tests employed. In

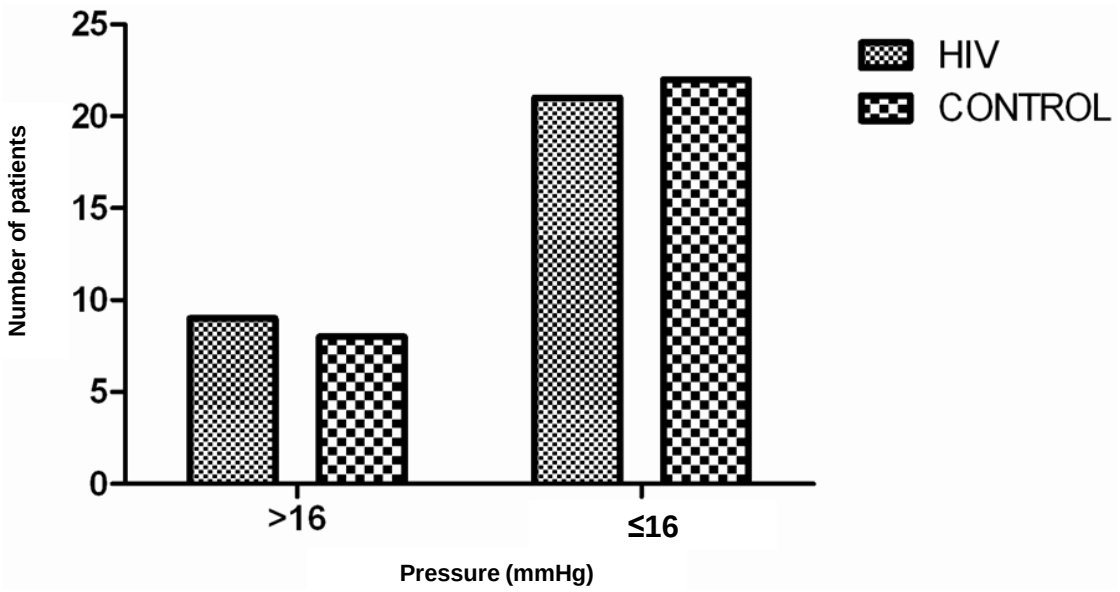

Figure 7. The results of the hand grip contigency data are given as ΔDBP.

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comparing this study with other published data, these results are comparable but show that AD can exist in the absence of AIDS. The utility of multiple tests for detection of AD is essential in showing its presence.

The limitation to the study is the small sample size in both the control and the study group. However, despite the limited number of patients, the results were significant for showing autonomic dysfunction in the HIV patients when compared to non-HIV matched controls. As such, we recommend a larger study which can employ other tests for autonomic dysfunction and a correlation with CD4 count, viral load and duration of infection.

Conclusion

The relationship between HIV infection and cardiovascular disease is significant; this study aimed to show that HIV does affect the autonomic nervous system. The study demonstrates the high prevalence of autonomic dysfunction in HIV infected patients and the lack of correlation with markers of disease severity or disease duration. This study is a testimony that HIV may have asymptomatic autonomic dysfunction and unless sought after, it may be missed. The patients studied showed an abnormal response to most tests employed (4/5). These results indicate that despite acceptable CD4 counts in HIV patients, autonomic dysfunction is present.

ACKNOWLEDGMENTS

There were no funding for this study; all costs for the research were paid by St Michael's medical center Cardiology department. An Ethics Committee approval was given for this study, prior to the start of the start through our Institutional Review Board (IRB). Also there are no financial, institutional, or consultant sponsorship that is related to neither the submission nor any association that might pose a conflict of interest in connection with the submission.

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Full Length Research Paper

Randomized control trial to evaluate yoga-based peer support group for human immunodeficiency virus (HIV) positive Zambian adolescents

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It has been shown that Human immunodeficiency virus (HIV) positive adolescents are more vulnerable to behavioural problems than non-infected adolescents and stress compromises immune function. There is some evidence that yoga and peer support benefits mental health. This study aimed to evaluate the impact of a 10-week programme of peer support and yoga on the psychological well being of HIV positive Zambian adolescents. An exploratory randomized controlled trial design was used. Adolescents aged 11 to 16 (n = 34) were randomized to peer group with yoga, peer support only group/social support group or waitlist control. Outcomes were immune function (CD4 count), self-rated physical health (SF12), psychological well being (Strengths and Difficulties Questionnaire). Outcomes were measured pre intervention, post intervention and at 10 weeks follow-up. There were no differences between the yoga and peer support group and the peer support only group, and both were evaluated well by participants. The peer only group had fewer emotional symptoms after the intervention ($p < 0.05$), while a combination of yoga and peer support group had a beneficial effect on CD4 count ($p < 0.05$). There were no differences between the groups at 10-week follow-up. Peer support/social support interventions were associated with short term benefits for the psychological and physical well-being in HIV positive adolescents, suggesting the need for sustained support.

Key words: Human immunodeficiency virus (HIV), acquired immune deficiency syndrome (AIDS), adolescents, yoga, peer support.

INTRODUCTION

Human immunodeficiency virus (HIV) and Acquired immune deficiency syndrome (AIDS) is a significant threat to health and well-being in sub-Saharan Africa and in Zambia the prevalence rate reached 21% in 2002 (Slonim-Nevo and Mukuka, 2005). Around 85,000 children aged 0 to 14 years are living with HIV in Zambia and although improvements in anti-retroviral medication and increased availability of treatment has reduced the rate of perinatal transmission (Battles and Wiener, 2002), the number of children surviving into adolescence is increasing.

Psychological consequences of HIV is also well documented in various research studies, it is estimated that about 60% of HIV-1 infected individuals will suffer from at least one depressive episode during the course of their illness (Lyketos, 1993). The psychological impact of HIV infection may be particularly harsh during the teenage years since depression, anxiety, history of trauma, and behaviour problems also occur at a higher than average rate during this period (Brown et al., 2001). HIV positive adolescents are not only undergoing the inevitable biologic, cognitive and social developmental challenges of adolescents, but are also enduring the challenges of managing a chronic illness. Studies in developed countries have suggested that adolescents with HIV infection often experience difficulties with peers

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and self image (Chapman, 1998). Furthermore, there is also considerable stigma associated with HIV infection in African countries, and social rejection may contribute to the increased prevalence of depressive symptoms associated with the condition (Maj, 1996). For example, first generation immigrants of African origin who were HIV positive were observed to have very limited social networks (Asander et al., 2004), and a Zambian study of 127 HIV positive adolescents found high rates of emotional difficulties and problems with peer relationships (Menon et al., 2005).

Psychological interventions seem to be effective for the psychological problems faced by HIV positive adolescents. An effective intervention identified by many studies (for example, Funck-Bertano et al., 2005) is a peer-support group that involves seeking and receiving help from other people is a major form of coping. The availability of someone to provide help or emotional support may protect them from the negative consequences of illness and stress (Sherbourne, 1988). Having social support is a crucial aspect of adolescents, but this seems crucial for those who have chronic illness (Berkman, 2000). This study also reports that social support has an effect on an individual's immune system, mortality risk and survivability when faced with serious illness. Social support can enhance emotional well-being and buffer HIV-related psychological distress and physical symptoms (Donenberg and Pao, 2005). Funck-Bertano et al. (2005) suggests that peer support group had beneficial effect on the adolescent's acceptance and perception of their HIV infection.

As knowledge of HIV and the human immune system continues to grow, the prevention and treatment of HIV becomes increasingly complex. As a result, a multi-disciplinary approach requires the medical community to look at alternative approaches to treatment, including western and eastern medicine, nutrition and exercise. Exercise helps many people with HIV disease feel better and strengthen the immune system. Physical exercise and psychotherapy to reduce stress can enhance immune functioning in people with AIDS (Antoni et al., 1990). Research has verified the beneficial effects of exercise on psychological health and well-being across populations. For instance, regular physical activity is associated with reduced symptoms of anxiety and depression (Kaplan and Cohen, 1991). In addition to the well-documented physical health benefits of regular exercise, physical activity has been shown to be associated with a variety of psychological variables, including mood, stress reactivity, and cognitive functioning. Regular physical activity is associated with reduced symptoms of anxiety and depression (Kaplan and Cohen, 1991).

Social factors may provide exercise motivation. Research within the leisure and recreation industry has indicated that the social support system available within a recreation environment or at a recreation agency is one of the factors which increase customer loyalty (Iwasaki and Havitz, 2004). Individuals who utilize a particular fitness facility stay more loyal to that facility if they have established a social network of friends and peers within that setting. Further research has found that social factors may be particularly important to exercise adherence within the African American community (Izquierdo-Porrera et al., 2002). This may be important when considering a social support intervention for HIV positive adolescents; an intervention that includes exercise may have an additional benefit on their physical and psychological well-being.

Yoga may be a useful exercise based intervention to enhance the physical and psychological well-being of HIV positive adolescents. Yoga is usually performed in group, is gentle and does not require much exertion. In a recent survey of complementary and alternative medicine providers, yoga was identified as an appropriate treatment for stress, anxiety and for pain (Long et al., 2001). Yogasana (physical postures in yoga) practice provides a gentle, natural means of supporting the immune system on a day-to-day basis (Pirisi, 2000). It has been argued that yoga helps lower stress hormones that compromise the immune system, while also conditioning the lungs and respiratory tract, stimulating the lymphatic system to oust toxins from the body, and bringing oxygenated blood to the various organs to ensure their optimal function.

The practice of specific asana can help balance the immune system and help support the thymus and blood to the sinus (Pirisi, 2000). While asana can help the immune system, yoga breathing techniques can condition the lungs and maximize one's breathing capacity that would build resistance to preying organisms (Kraftsow, 1999).

Study justification

Literature is suggestive that stress and depression may be outcomes of HIV infections. As improved clinical care enables HIV-infected persons to live longer, mental health interventions that are sensitive to the complex dynamics of HIV and AIDS are also urgently needed. Peer support has been identified as an effective coping strategy, therefore support strategies aimed at broadening the patient's network and breaking their isolation need to be continued and strengthened. Although peer programmes are frequently advocated for HIV positive adolescents, a large majority of these studies have investigated their effectiveness in terms of peer education and AIDS prevention. A yoga intervention is usually carried out in small groups that could also serve as a peer group. Furthermore, yoga, when compared to other exercises such as aerobics, is gentle and relaxing, and can be easily performed without much physical strain. Peer support also acts as buffer against stressful life

events by enhancing coping effectiveness, self-esteem, motivation or involvement in health promoting behavior (Murphy et al., 2000).

Study objectives

This study aimed to evaluate the impact of a 10-week programme of peer support and yoga on psychological and physical health of HIV positive Zambian adolescents.

METHODOLOGY

Design

An exploratory randomized controlled trial of a peer support and yoga-based intervention, comparing it to a peer support/social support only intervention and a waitlist group was used.

Participants

The participants were recruited from the University of Zambia clinic. The inclusion criteria for the study were that participants should have HIV positive sero status, be aware of their HIV status, aged between 11 and 16 years and receiving anti-retroviral treatment for at least one year. Participants were required to have been on anti-retroviral treatment so as to measure the impact of the intervention on immune function.

Measures

Immune function

The CD4 count tells how strong the immune system is, how far HIV disease has advanced (the stage of the disease), and helps predict the risk of complications and debilitating infections. The CD4 count is most useful when it is compared with the count obtained from an earlier test. Normal CD4 counts in adults range from 500 to 1,500 cells per cubic millimeter of blood. In general, the CD4 count goes down as HIV disease progresses. Blood sample is drawn from a vein in the arm and tested.

Psychological well-being [strengths and difficulty questionnaire-youth (SDQ-Y) version (Goodman, 1997)]

This is designed to be completed by children aged 11 to 15. The SDQ-Y has been shown to discriminate between a community sample of adolescents and those attending a mental health clinic (Goodman et al., 1998). Scores for the youth SDQ were shown to produce similar results to that of the parent SDQ. In a study on Dutch youths, internal consistency, test-retest stability and parent-youth agreement of the SDQ scales have been shown to be acceptable (Muris et al., 2003). SDQ-Y (English and translated versions) has been previously used with Zambian adolescents in school sample (Menon et al., 2006) and HIV positive sample (Menon et al., 2005) and was found to be a useful measure of emotional and behavioural well-being in Zambian adolescents. The SDQ produces scores for each of five subscales: conduct problems; hyperactivity; emotional symptoms; peer problems; and prosocial behaviour. Each of these consists of five items. Each difficulty item is scored on a 0 to 2 scale (not true, somewhat true and certainly true), while the items indicating strengths (except the prosocial items) are reversely scored. A 'total difficulties' score is calculated by totaling the four deficit focused subscales (that is all, except for prosocial behaviour).

Social support [medical outcomes study (MOS) social support survey (Sherbourne and Stewart, 1991)]

This brief, self-administered social support survey instrument was developed for patients in the Medical Outcomes Study (MOS), a two-year study of patients with chronic conditions. It is easy to administer to chronically ill patients, and the items are short, simple, and easy to understand. Twenty items rated 1 to 5, with higher scores indicating greater social support. The measure generates a total score reflecting overall support and 4 subscales (tangible support, affectional support, positive social interactional support and emotional/informational support). High internal-consistency reliability is reported for all scales, exceeding 0.5 standards. When compared to other measures, it correlated most highly with measures of loneliness or emotional ties, followed by measures of family and marital functioning and mental health. Lowest correlations were with the measures of physical health such as physical functioning and pain intensity. In this study, ‘peer support’ is being used interchangeably with ‘social support’.

Self- rated physical health (SF-12)

The 12-item Short-Form health survey (SF-12) was developed in the United States as a shorter alternative to SF-36 to describe mental and physical status and to measure outcomes of health care services. SF-12 has a subset of 12 items from SF-36 from the physical summary measure, one item from the bodily pain (BP), general health (GH) and two items from physical functioning (PF) and role-physical (RP), and six items from the mental summary measure, that is, one item each from vitality (VT) and social functioning scales (SF) and two items each from role-emotional (RE) and mental health (MH) scales. All the 12 items are used to calculate the Physical component summary and Mental component summary. SF-12 has been previously used in research studies (Clarke et al., 2005; Boothroyd et al., 2005) as a measure of physical and mental health with adolescents.

Procedure

Baseline (pre intervention)

Children meeting the inclusion criteria were informed about the study and asked if they would be willing to participate in the peer support yoga group. Signed consent was obtained from children and parents/guardians. Children were grouped into threes by age. At baseline, children completed the SDQ, SF-12 and the Social support survey. CD4 T-cell count was also taken. One child in each group was randomised to the yoga and peer support group or peer support/social support only group or the wait list group.

Intervention

The group intervention was carried out over a 10-week period with 2 sessions per week. Each session lasted an hour and was divided into two parts. The first half of the session was identical for yoga and peer support group, as well as for peer support only group. This involved participative group discussions and activities on health related topics, especially on HIV and AIDS. During this

session, the participants were encouraged to share their experiences and learn from each others experience. The latter part for the yoga and peer support group involved relaxing group exercises and activities such as story reading, coloring, non-competitive games (craft activities) for the peer support only group. The researcher is a certified yoga instructor.

Gentle relaxing group exercises based on yoga

This includes:

1. Breathing practices aimed at bringing into utilisation all the lobes of the lungs to make breathing continuous and rhythmic;
2. Physical postures or asana to develop and strengthen the muscles and stamina of the organs and systems of the body, promoting positive health and overall well being. The actual asana used in the intervention was decided depending on the ease and comfort of the participants in performing them. Two asana from standing, sitting, prone and supine positions were used;
3. Deep relaxation aimed at relaxation and anxiety reduction. The participants were subjected to deep relaxation after the physical postures;
4. Pranayama or breath control aimed to achieve controlled breathing and reduce physical symptoms of anxiety. The session ended with a pranayama.

Ten-week follow-up

At the ten-week follow-up, all participants completed the SDQ, SF 12 and Social support questionnaire. CD4-T cell count was also obtained. Participants in the intervention group were interviewed concerning their views about the intervention.

Data analysis and management

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) for windows version.15.0. Descriptive statistics were used to describe the demographic characteristics of the sample. Non-parametric analysis of variance (Kruskal Wallis) was used for non-normally distributed (from SF 12), ordinal data and repeated measures analysis of variance was used to analyse data from SDQ. The data from each participant was coded to ensure confidentiality, and identifying details were stored separately from the data. Data were analysed on an intention to treat basis by substituting baseline data for missing values.

RESULTS

There were 76 children in the age group of 11 to 16 registered in the pediatric Anti-retroviral clinic at the University of Zambia clinic. Of these, 34 had parents or guardians consent to their participation in the study and attended the baseline session and therefore included in the study. Twelve children were randomised to peer-support plus yoga intervention, 11 to peer-support only and 11 to waitlist control. All the children in the two intervention groups remained in the study post-intervention and at 10 weeks follow-up. In the wait list control, one child died between baseline and post-intervention and 4 were lost to follow-up. Characteristics of the sample are shown in Table 1.

SDQ scores

SDQ scores were obtained from the three groups at the three time points and compared. There were no significant differences in SDQ scores at baseline. Immediately after the 10 week intervention, the social support and craft activity group had lower scores on emotional symptom scale ($Z = -2.57$, $p = 0.01$) when compared to the waitlist group (Figure 1). There were no differences between the groups at follow-up.

Scores obtained on MOS social support

There were no significant differences in the scores obtained by the participants on the four sub scales and for total social support.

SF-12 scores

There was a significant difference in the scores on role emotional subscale at Time 2. The yoga support group had significantly lower scores than social support group ($z = -2.5$, $p = 0.014$) and waitlist group ($z = -1.9$, $p = 0.046$) for role emotional support. SF-12 scores for general health scale and role emotional scale at different time points are shown in Table 2.

CD4 T-cell count at the three time points

A repeated measures Analysis of variance (ANOVA) was conducted with CD4 count as the dependent variable group as the between subjects factor, and time of testing as the within subjects factor. There was a main effect of time with CD4 count significantly increasing between Time 1 and Time 2 ($t = -2.9$, $df = 33$, $p = 0.006$) and decreasing significantly between Time 2 and Time 3 ($t = 5.1$, $p = 001$). There was no effect of group and no linear interaction between group and time. Change scores were calculated by subtracting Time 2 from Time 1 and Time 3 from Time 1 (Table 3). There were no differences in change scores between the peer support group and waitlist or between the yoga peer support group and peer support only group. However, the yoga group had significantly more improved scores at Time 2 compared to waitlist ($t = 2.351$, $p = 0.019$). Differences in CD 4 T-cell count at the different time points are shown in Figure 2.

DISCUSSION

Although significant advances have been made in the

Table 1. Characteristics of the sample.

Parameter	Yoga peer support group (Group2) (n = 12)	Peer support only (Group 0) (n = 11)	Wait list group (Group 1) (n = 11)
Mean age (SD)	12.7 (2.1)	13.4 (1.6)	12.8 (2.0)
Gender			
Male	10	6	6
Female	2	5	5
Residence			
Both parents	0	1	1
One parent	5	5	5
Other relatives	7	5	5
Average period on ARVs (months)	22.5	16.5	22
Route of transmission			
MCT	11	11	11
Risky behaviour	1		

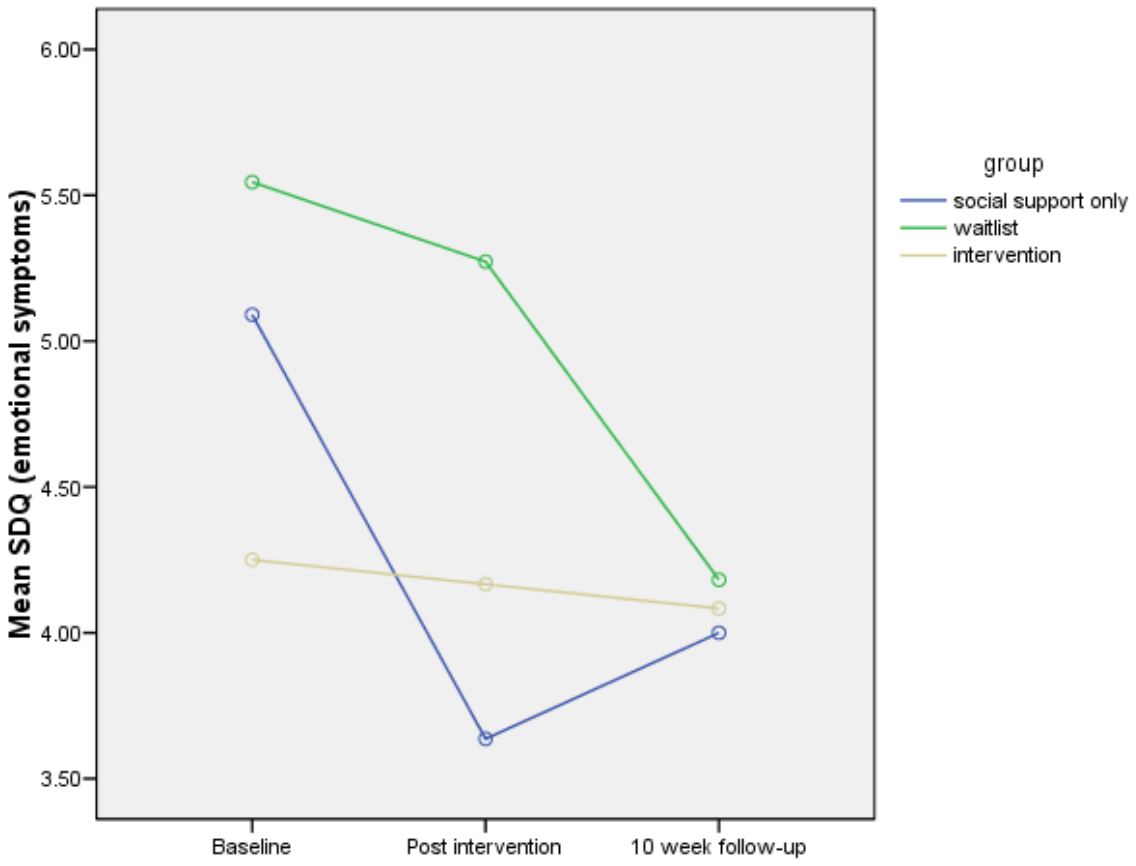

Figure 1. Emotional problem sub-scale score by group.

treatment of serious disease such as HIV and AIDS, there remains much scope for assisting young people in adjusting to life with a chronic medical condition. Commonly, chronically ill young people experience lower

Table 2. SF-12 scores at the different time points.

Parameter	Yoga and peer support group (Group2)	Peer support only group (Group 0)	Wait list group (Group 1)	P value
General health				
Time 1				
Mean (SD)	59.8 (38.8)	45.2 (30.1)	53.4 (25.7)	$X^2 = 1.20$
Median (IR)	61 (25-100)	25 (25-61)	25 (25-61)	p = 0.55
Time 2				
Mean (SD)	80.6 (22.2)	74.6 (23.2)	53.8 (30.8)	$X^2 = 4.80$
Median (IR)	84 (66.7-100)	84 (66.7-100)	61 (25-84)	p = 0.09
Time 3				
Mean (SD)	82.8 (11-9)	80.6 (14.1)	66.4 (24.3)	$X^2 = 3.79$
Median (IR)	84 (84-84)	84 (61-84)	61 (61-84)	p = 0.15
Role emotional support				
Time 1				
Mean (SD)	51 (18)	45.5 (21.8)	55.7 (22.6)	$X^2 = 0.96$
Median (IR)	50(40.6-59.3)	50 (25-50)	50(50-62.5)	p = 0.62
Time 2				
Mean (SD)	40.7 (25.2)	65.9 (18.6)	61.4 (18.1)	$X^2 = 7.49$*
Median (IR)	43.8(28.1-59.4)	62.5(50-75)	50 (50-75)	p = 0.02
Time 3				
Mean (SD)	61.5 (28.4)	63.6 (27.6)	68.2 (17.1)	$X^2 = 0.66$
Median (IR)	50(40.6-96.9)	62.5(50-100)	75 (50-75)	p = 0.72

*p < 0.05

Table 3. Difference in CD4 T-cell counts at difference time points.

Yoga peer support group	Mean at Time 1	Mean at Time 2	Mean at Time 3	t-value
CD4a-CD4b	525.0	632.6		-2.8*
CD4a-CD4c	525.0		444.8	1.6
CD4b-CD4c		632.6	444.8	5.9*
Peer support only group				
CD4a-CD4b	437.9	419.1		-1.8
CD4a-CD4c	437.9		419.1	0.2
Wait-list group				
CD4a-CD4b	486.9	516.9		-0.8
CD4a-CD4c	486.9		474.5	-0.2
CD4b-CD4c		516.9	474.5	1.0

*p < 0.05.

emotional well being than their healthy peers (Olsson et al., 2000). This study provides some evidence for the positive effect of support group with HIV positive adolescents. This is in line with previous research studies that suggest that peer support might act to improve resilience and well being (Olsson and Toumbourou,

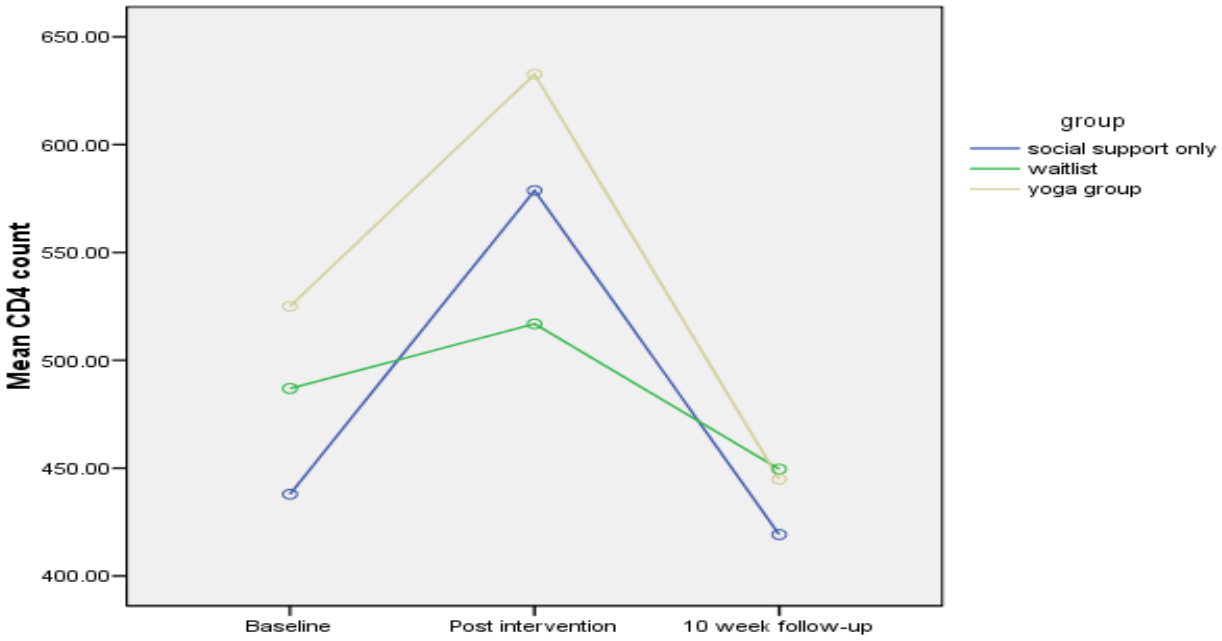

Figure 2. Change in CD4 count at different time points

1996; Weiner et al., 2006).

Research suggests that HIV positive individuals have high rates of psychological disturbance (Funck-Brentano et al., 2005). This is of particular concern since stress and psychological status may affect disease progression in HIV infected individuals (Kopnisky et al., 2004) and psychosocial factors have been shown to have clinically significant relationships with immune related outcomes for HIV (Kiecolt-Glaser et al., 2002). Social support seems to have a positive effect in enhancing the emotional well being of participants in this study. The participants in the peer support only group had less emotional problem (as measured by SDQ), immediately after the ten week intervention, when compared to the other two groups.

Studies indicate that yoga has been beneficial in reducing anxiety and depression in older adults who attended a geriatric clinic and presented with a wide range of effective symptoms related to anxiety and depression (Allen and Steinkohl, 1987). But the score on role emotional scale of SF-12 indicates that the yoga and social support group had less emotional problems when compared to the peer support only group and the waitlist group. Sherman et al. (2000) provided evidence that sharing one's diagnosis with friends can provide observable health benefits and may also improve psychological health, indicating the importance of disclosure.

In this study, the participants of yoga and social support group show significantly higher CD4 at immediately after the intervention, as compared to the other two groups. Therefore, it could be argued that it may be the practice of yoga based exercise which may have led to the higher CD4 count in this group. This is in line with the findings of other research studies (Kraftsow et al., 1999) which suggest that practice of yoga may reduce the level of stress hormones that compromise the immune functioning. This finding also confirms the findings of a recent study evaluating a peer support group as therapy for adolescents with HIV that demonstrated a decrease in viral load in participants attending peer support group (Funck-Brentano et al., 2005). Higher CD4 at baseline was related to better social support, thereby again supporting the findings of Funck-Brentano et al. (2005).

Some studies demonstrated that exercise is able to increase CD4 T-cells of HIV infected individuals (Cooper, 1994). Lethargy and fatigue which are typical with advancing of HIV infection may be a compensatory mechanism to conserve body mass in light of increased resting expenditure of energy, and exercise may have the potential to at least temporarily reverse this. Other studies have also supported the benefit of yoga on the psychological wellbeing of HIV positive individuals. Caroleo (1994) identified several therapeutic recreation programs that reduce stress and anxiety in HIV positive individuals including "yoga, massage, acupuncture, acupressure, chiropractic services, meditation, reiki, physical and breathing exercises and visualization". In our study, the participants in the yoga support group had higher self-rated physical health after the intervention when compared to the control group. Yoga can also be viewed as a group support, as it is done in groups, and may therefore lead to the same benefits of social support group, with an added advantage of exercise, especially yoga-based.

Strengths and weaknesses of the Study

The strengths of this study are the randomization of participants into the intervention and waitlist groups. The participants were also matched for age and gender to minimize variation between groups. The study also used standardized outcome measures. There were a small percentage of drop outs in the wait list group. The small sample size of the study may also limit the generalization of its findings.

CONCLUSION

Conventional approaches to promoting emotional well being have involved referring young people and their families to an appropriate public mental health service or psychologist/psychiatrist in private practice. However, there is increasing interest in the use of peer support programs (Olsson et al., 2000). Our study found evidence for the benefit of peer support and yoga based exercises for HIV positive adolescents.

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Full Length Research Paper

Rapid human immunodeficiency virus (HIV) testing on the college campus: Comparing traditional and outreach models

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The purpose of this study was to compare rapid human immunodeficiency virus (HIV) testing services on a college campus between a clinic-based group and an outreach-based group. Study participants were 1,233 individuals who underwent HIV counseling and testing. Questionnaires assessed demographics and HIV transmission risk behaviors. Results indicate that outreach-based testers were more likely to be younger, female, and African American relative to clinic-based testers. Overall 100% of clinic-based testers and 99.5% of outreach-based testers received their test results. All individuals with positive rapid test results received confirmatory blood testing and entered medical care within one week of preliminary diagnosis. College campuses may provide a unique setting to deliver HIV testing and may help increase the percentage of young people who are aware of their serostatus, particularly younger, female, and African American students who may be less likely to undergo testing in traditional clinic settings.

Key words: Rapid human immunodeficiency virus (HIV) testing, college students, outreach HIV testing.

INTRODUCTION

Nearly 40% of all new human immunodeficiency virus (HIV) infections in the United States occur among adolescents and young adults under the age of 29, primarily via sexual activity (Centers for Disease Control and Prevention [CDC], 2011). However, college students have not traditionally been viewed as a population at high risk for HIV transmission, despite being a sub-population that has recently experienced a rising incidence rate. The first HIV outbreak among college students was documented between 2000 to 2003, among 84 college students, most of whom were men who had sex with men (MSM) or men who had sex with men and women. These cases spread across 37 academic institutions, and a sexual partner network investigation linked 21 colleges, 61 students, and 8 partners of students (Hightow et al., 2005).

Recent research has demonstrated that young adults have a low perceived risk of HIV infection (Opt and Loffredo, 2007; Sutton et al., 2011) despite engaging in high-risk behaviors that may expose them to HIV and other sexually transmitted infections (Trepka et al., 2008). In addition, previous studies have shown that although college students possess accurate knowledge about HIV transmission and methods of protection, this knowledge does not necessarily translate into health-promoting safer sex behaviors (Opt and Loffredo, 2004; Sutton et al., 2011). While most college students report being sexually active, (American College Health Association, 2012) self-reported HIV testing does not mirror sexual activity behaviors, with testing rates ranging from 21 to 52% (Buhi et al., 2010; Caldeira et al., 2012). This low testing prevalence may be partially explained by the low perceived risk of HIV infection.

It is estimated that approximately 20% of individuals who are living with HIV in the United States are unaware of their HIV status and may transmit HIV without knowing that they are putting partners at risk (CDC, 2008). This rate is more striking among young people, with estimates that nearly half of 13 to 24 year-olds living with HIV have not been diagnosed (Campsmith et al., 2010). Two main

factors may contribute to this lack of awareness: never being tested or failure to receive results after being tested. HIV prevention efforts have traditionally included information not only about risk reduction such as safer sex practices, but also about the importance and availability of HIV testing for those at risk.

Many public health advocates argue that rapid testing will continue to revolutionize HIV testing by reducing or perhaps eliminating the need to return for test results on a later date, thus increasing the proportion of HIV-positive individuals who are aware of their status. Furthermore, efforts to increase testing rates and reduce fear associated with testing need to normalize the testing process and decrease the stigmatization of test-seeking behaviors (Anastasi et al., 1999).

In 2003, CDC introduced the Advancing HIV prevention initiative in an effort to increase the proportion of persons aware of their HIV serostatus. One strategy of the initiative is to implement new models for diagnosing HIV infections outside medical settings. Three years later, the CDC released a report outlining their revised recommendations for HIV testing, which included not only routine screening for HIV among adults, adolescents, and pregnant women in health care settings in the United States, but also advocated for reducing barriers to HIV testing (Branson et al., 2006).

Rapid HIV testing may aid in increasing the proportion of individuals living with HIV who know their status, by increasing the number of persons who are actually tested and receive test results (Spielberg et al., 2005; Hutchinson et al., 2006). In addition, there is a high likelihood of entry into medical care after receiving an HIV diagnosis for those who undergo rapid testing, as individuals are often quickly linked to a health care provider (Leider et al., 2011; Sattin et al., 2011). In particular, those who are diagnosed with a rapid HIV test have relatively high rates of adherence to their first medical appointment (Kendrick et al., 2005; Roberts et al., 2007).

While previous studies have examined preferences for HIV testing methods such as rapid oral fluid, rapid fingerstick, and traditional venipuncture among different populations (Cohall et al., 2010; Huebner et al., 2010), few studies have compared rapid oral fluid testing based on the test location or setting, and no studies have compared such testing among young adults or college students in particular.

The availability and accessibility of voluntary counseling and testing services utilizing rapid HIV testing technology can serve a key niche in controlling the spread of the virus and reducing transmission rates. Although HIV prevention research on college campuses has been conducted, few studies have examined the demographic characteristics and reported HIV risk behaviors of a sample of young adults undergoing rapid HIV antibody testing based on test setting. The first objective of this study was to survey and compare demographics, reported risk behaviors, and previous HIV testing experiences of individuals seeking rapid oral testing at a clinic-based service versus an outreach-based event. The second objective was to address practical implications of offering rapid oral HIV testing on a college campus, including receipt of test results and linkages to care for those who test positive.

MATERIALS AND METHODS

Participants and procedures

After approval by the Institutional Review Board of the University of North Carolina at Chapel Hill, a retrospective analysis of two groups receiving HIV counseling and testing on a college campus in the Southeast was conducted. The first group included clients at the counseling and wellness office of the university's student health service between March 1, 2005 and February 28, 2007. The second group included clients attending two outreach-based, walk-in rapid HIV testing events on the same college campus during this time period.

The first group included individuals who received counseling and testing by one of four state-certified HIV counselors at the counseling and wellness office. An identification number was assigned to each client in person or over the telephone, when scheduling an appointment, to ensure anonymity in the scheduling process. Those clients who consented to HIV counseling and testing underwent a standard pre-test counseling session in compliance with state guidelines. During this pre-test session, counselors identified and recorded client demographics, HIV transmission risk behaviors in the previous 12 months, and any previous HIV testing experience, using the state-developed counseling and testing form.

Clients requesting a rapid oral test self-administered an OraQuick® *Advance*™ Rapid HIV-1/2 Antibody Test (OraSure Technologies, Inc., Bethlehem, Pennsylvania). Testing of the collected specimen was conducted by counselors. After 20 min, counselors delivered test results to clients and provided immediate post-test counseling, including an explanation of the meaning of the test result, a discussion of the need for follow-up testing for those clients in the window period, risk reduction counseling, and distribution of condoms and sexual health pamphlets. Preliminary positive test results were delivered by the original pre-test counselor, and clients immediately received confirmatory blood testing on site, as well as referral to an infectious disease physician. The 438 clients requesting a traditional venipuncture test at the counseling and wellness office during the two-year time period are excluded from this analysis.

The second group included individuals receiving HIV counseling and testing at two outreach-based walk-in HIV testing events on December 1, 2005 and December 1, 2006. In conjunction with broader World AIDS Day activities, the rapid HIV testing events were integrated into awareness events taking place on the same college campus. Recruitment efforts focused primarily on the student population via fliers, newspaper advertisements, volunteers hosting an HIV informational booth in a central location on campus, and a candlelight memorial vigil held the preceding evening. The outreach-based walk-in testing events were held in a high-traffic campus location, and testing was offered for free to the general public.

The testing protocol was standardized to ensure efficiency and consistency. First, individuals were greeted by a volunteer who described the counseling and testing procedure. Interested individuals were then given a packet of information that included a risk assessment form, two copies of the informed consent form, an

information sheet on rapid HIV testing, and a sticker with a unique identification number. Individuals completed the risk assessment form that included demographic questions, HIV transmission risk behaviors in the previous 12 months, and previous HIV testing experience. Clients were then called by their identification number to meet with a trained HIV counselor, with whom they reviewed HIV transmission routes, HIV antibody rapid testing protocols, risk reduction strategies, and implications of positive and negative results. Individuals comfortable with the testing process signed the consent form and self-administered an oral OraQuick® *Advance*™ Rapid HIV-1/2 Antibody Test. Clients returned to the waiting area while their tests were run in a separate room.

Post-test counselors called clients by their unique identification numbers and delivered test results to individuals in a private room, explained the test results, and encouraged those clients who had engaged in high risk behavior within the last three months to seek further testing. Preliminary positive test results were delivered to clients by their original pre-test counselor who discussed the implications of a positive antibody test and the need for an immediate follow-up confirmatory blood test. Clients then had the opportunity to meet with an infectious disease physician in conjunction with the counselor who arranged confirmatory testing and an appointment at the local infectious disease clinic.

Statistical analysis

A comparison of demographic variables, reported sexual risk behaviors, and previous HIV testing between the two groups was conducted using Stata version 11.0 (Stata Corporation, College Station, Texas). Basic descriptive statistics were performed to determine the proportion of individuals who underwent testing at the counseling and wellness office versus the outreach-based setting during the study time period. Chi-square tests of association were used to determine differences in participant characteristics based on test setting. Logistic regression models were used to assess whether demographic variables, sexual risk behaviors, and previous HIV testing were associated with test setting. Variables that had a p value of < 0.05 in bivariate analyses were entered into a multivariate logistic regression model to evaluate the independent associations between the predictor variables and test setting. Their respective odds ratios and 95% confidence intervals were calculated.

RESULTS

Description of study participants

During the study period, a total of 792 clinic-based testers and 441 walk-in testers underwent HIV counseling and testing. Table 1 presents the demographic characteristics, sexual risk behaviors, and previous HIV testing experience of the two groups. The outreach-based testing group had a higher proportion of female testers (63.7%) than the clinic-based testing group (54.3%). The mean age of outreach-based testers was 21.26 years testers (standard deviation [SD] = 3.81) compared to 23.64 years (SD = 4.28) for clinic-based testers. The majority of outreach-based testers (82.9%) were between the ages of 18 to 22, a traditional undergraduate student age range, compared to approximately 50.3% of clinic-based testers. The outreach-based testing group had a higher proportion of Black/African Americans (36.7%) than the clinic-based group (16.8%).

Risk behaviors

Overall, most individuals who underwent HIV testing were sexually active, with 89.7% of the respondents reported at least one sexual partner in the last 12 months (87.5% of outreach-based testers and 90.9% of clinic-based testers). In terms of reported sexual behaviors among those who were sexually active in the previous 12 months overall, 42.5% reported engaging in sexual activity while using non-injecting drugs such as alcohol or marijuana (17.7% of outreach-based testers and 56.3% of clinic-based testers). Almost half of clinic testers (46.2%) reported sex with some other HIV risk, such as sex with multiple partners in the past year, compared to outreach-based testers (14.1%). Overall, a small percentage of testers reported engaging in sexual activity with a person who they knew had HIV (0.2% of outreach-based testers and 2.3% of clinic-based testers) and few reported sexual activity with an intravenous drug user (0.2% of walk-in testers and 1.6% of clinic-based testers). Eleven percent of the overall sample reported having sex with a man who has sex with men, with a higher proportion found among clinic-based testers. In addition, 8.4% reported receiving a sexually transmitted infection (STI) diagnosis in the previous 12 months, with a greater proportion among clinic-based testers compared to outreach-based testers (11.6% versus 2.7%, respectively). There was also a noted difference in reported sexual violence, with 4.7% of clinic testers reporting sexual assaults in the past year compared with 0.4% among walk-in testers. In terms of previous HIV testing experience, approximately half of participants reported being tested for HIV (49.6%), with a higher proportion of clinic-based testers reporting previous testing (55.9%) compared to outreach-based testers (38.3%).

Bivariate analysis

Three demographic variables were significantly associated with the outcome variable of being tested at an outreach-based event, with females, younger respondents, and Blacks/African Americans being more likely to undergo HIV counseling and testing at an outreach-based event versus clinic-based testing. Six sexual risk variables were significantly associated with testing site, including the following reported behaviors in the previous 12 months: sex while using non-injecting drugs, sex with an HIV-positive person, sex with a man who has sex with men, sex with other HIV risk (such as, multiple partners), STI diagnosis, and sexual assault. Finally, previous HIV testing was significantly associated with testing site, with first-time testers being more likely to be screened at outreach-based events than clinic-based testing services.

Table 1. Characteristics of study participants by HIV testing site.

Variable	Total (n = 1,233) (%)[a]	Clinic-based testing (n = 792) (%)	Outreach testing (n = 441) (%)	x^2 p-value
Demographics				
Gender				
Female	57.6	54.3	63.7	0.001
Male	42.4	45.7	36.3	
Age group				
18-22	61.2	50.3	82.9	0.001
>22	38.2	49.7	17.1	
Race/Ethnicity				
Black, not Hispanic	23.9	16.8	36.7	
White, not Hispanic	62.4	69.2	50.1	<0.001
Other	13.7	14.0	13.2	
Sexual behavior in previous 12 months				
Any sexual activity	89.7	90.9	87.5	0.064
Sex while using non-injecting drugs	42.5	56.3	17.7	<0.001
Sex with both genders	4.6	4.7	4.3	0.755
Sex with HIV+ person	1.6	2.3	0.2	0.007
Sex with IV drug user	1.2	1.6	0.2	0.062
Sex with MSM	11.1	13.6	6.5	<0.001
Sex with other risk	34.7	46.2	14.1	<0.001
MSM[b]	34.0	34.1	33.8	0.934
STI diagnosis	8.4	11.6	2.7	<0.001
Sexual assault	3.2	4.7	0.4	<0.001
Previous HIV testing experience				
Any previous HIV test	49.6	55.9	38.3	<0.001

[a]Totals do not always match due to missing data; [b]Male participants only. MSM = men who have sex with men, IV=intravenous, STI = sexually transmitted infection.

Multivariate analysis

The final model consisted of seven variables and is presented in Table 2. Younger individuals (between the ages of 18 to 22) were more than four times as likely to be tested at an outreach-based event than in a clinic setting ($p < 0.001$). Race and gender were also significantly associated with testing in an outreach-based setting. Specifically, outreach-based testers were one and a half times as likely to be Black/African American and one and a half times as likely to be female ($p < 0.05$ and $p < 0.01$, respectively). Individuals who reported sexual risk behaviors including sex while using non-injecting drugs and sex with other HIV risk were 77% less likely to be tested at outreach-based events ($p < 0.001$ and $p < 0.01$, respectively). In addition, those individuals who reported receiving an STI diagnosis or sexual assault in the last year were less likely to undergo HIV testing at an outreach-based event ($p < 0.01$ and $p < 0.001$, respectively).

Receipt of test results

Post-test counseling rates were high in both groups, with 100% of clinic-based testers and 96.6% of outreach-based testers receiving their results the same day of testing. Thirteen individuals (2.9%) who underwent outreach-based testing received their test results on a later date through the counseling and wellness office (range = 1 to 12 days after testing). Two individuals failed to return to receive test results after repeated attempts to

Table 2. Final logistic regression model predicting outreach-based testing.

Final model variables	Adjusted OR[a]	95% CI[b]
Gender: Female	1.53**	1.14-2.04
Age group: 18-22 years	4.41***	3.21-6.06
Race: Black, not Hispanic	1.51*	1.09-2.10
Sex while using non-injecting drugs	0.29***	0.21-0.40
Sex with other HIV risk	0.29**	0.21-0.42
STI diagnosis	0.339**	0.17-0.68
Sexual assault	0.095***	0.02-0.42

[a]OR = odds ratio; [b] CI = confidence interval; *p < 0.05; **p < 0.01; ***p < 0.001.

contact them (0.5%).

Linkages to care

Overall, four individuals (0.3%) were newly diagnosed with HIV, two of whom underwent HIV testing at the counseling and wellness office and two at an outreach-based testing event. All four individuals with positive rapid test results accepted referral to medical care, received confirmatory blood testing, and entered medical care with the completion of a follow-up appointment with an infectious disease physician within one week of preliminary diagnosis. These individuals were subsequently confirmed to be HIV positive by Western blot testing, with no indeterminate or false positive tests.

DISCUSSION

Study findings suggest that college campuses may provide a unique setting for students to access HIV testing, particularly younger, female, and African American students who may be less likely to undergo testing in traditional clinic settings. The move away from the medical testing model reduced logistical barriers of scheduling and keeping appointments by bringing testing opportunities directly to the student population and expanding the venues in which HIV testing is conducted. A higher proportion of first-time testers were found at outreach-based events, which is a promising finding that may help to increase the percentage of young people who are aware of their serostatus, and who may not have opted to undergo HIV testing in a medical care setting.

A higher proportion of risk behaviors related to sex while using non-injecting drugs, sex with multiple partners, and sex with an HIV-infected person was found among the clinic-based group. It is possible that these higher rates are expected, as those who engage in risk behaviors are more likely to schedule an appointment for HIV testing as a way to determine their serostatus. Approximately 8% of the overall sample reported receiving an STI diagnosis in the last year, consistent with a recent study among college students (American College Health Association, 2012). Clinic-based testers were more likely to report an STI diagnosis as well as sexual assault in the previous 12 months compared to outreach-based testers. These differences are not surprising, as many individuals who are diagnosed with an STI or who are survivors of sexual assault are commonly referred to the counseling and wellness office for subsequent HIV testing.

Despite higher risk behaviors reported in the clinic-based group, there was no significant difference in the percentage of HIV-positive cases identified between the two groups. As on the primary goals of HIV testing is to help individuals be aware of their status, offering testing services in different venues may appeal to individuals for different reasons and outreach-based screening may be attractive to college students who have a low perceived risk of contracting HIV and yet are unaware of their status.

Data from our study indicate that receipt of test results was very high regardless of test location, with 100% of clinic-based testers and 99.5% of outreach-based testers learning their test result. These rates are consistent with previous studies on receipt of rapid test results in both clinic-based settings (Guenter et al., 2008; Kendrick et al., 2005) and outreach-based settings (Liang et al., 2005; Buchér et al., 2007). However, these rates were higher than that found in a CDC demonstration project of eight community-based organizations in which we found a test receipt rate of 75% (CDC, 2007).

Every individual who received preliminary positive results in our study was immediately referred to an infectious disease physician prior to receipt of confirmatory test results, consistent with findings suggested from a CDC-funded, multi-site Advancing HIV Prevention demonstration project (Bowles et al., 2008). This approach eliminates the need for clients to schedule two separate appointments to first receive confirmatory test results and then to follow-up with appropriate medical care. Individuals who tested positive at the outreach-

based events in particular had the opportunity to and met with an infectious disease physician immediately after their preliminary diagnosis, which may have also assisted in their acceptance of referral and subsequent linkage to care. Notably, recent advances in HIV testing suggest the use of an immediate second rapid HIV test as verification of a reactive first test to allow for on-site confirmation (Martin et al., 2011). Although not commonly conducted at the time of the present study, this new strategy is a promising alternative approach to the traditional method of waiting several days for a laboratory-based Western blot antibody confirmation and can aid in immediate linkage to care to avoid potential delays in treatment.

This investigation has some limitations that warrant discussion. First, our results reflect HIV testing at one public university in the Southeastern United States, which may affect the generalizability of our findings. Due to the retrospective nature of this study, it is not possible to verify self-reported sexual risk behaviors among those undergoing HIV testing. It is plausible that some participants may have provided inaccurate responses to questions regarding sexual risk behaviors for reasons of social desirability. Finally, the study did not track the rate of acceptance of rapid testing, specifically among participants at outreach-based events, and it is not possible to calculate the number of persons who initially expressed interest in obtaining a rapid oral HIV test but declined testing.

CONCLUSION

This study offers several practical implications of offering rapid oral HIV counseling and testing on a college campus for both clinic-based and outreach-based settings. First, the ability to provide HIV testing with fast, reliable test results was an advantage observed by test seekers and we found high rates of receipt of test results in both settings. Second, by offering outreach-based testing in a non-medical setting, we were able to access a population that may not be routinely engaged in routine medical care. Hosting outreach-based testing events in a high-traffic environment may have helped to de-stigmatize HIV testing and normalize the process among young people. The outreach testing events were also incorporated into the daily routines of individuals on college campuses rather than limiting HIV testing to a medical facility. It is postulated that the public nature of outreach-based testing events promoted conversation about HIV in general, and testing in particular, thus reducing stigma that surrounds both issues.

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UPCOMING CONFERENCES

7th IAS Conference on HIV Pathogenesis, Treatment and Prevention, Kuala Lumpur, Malaysia, 30 Jun 2013

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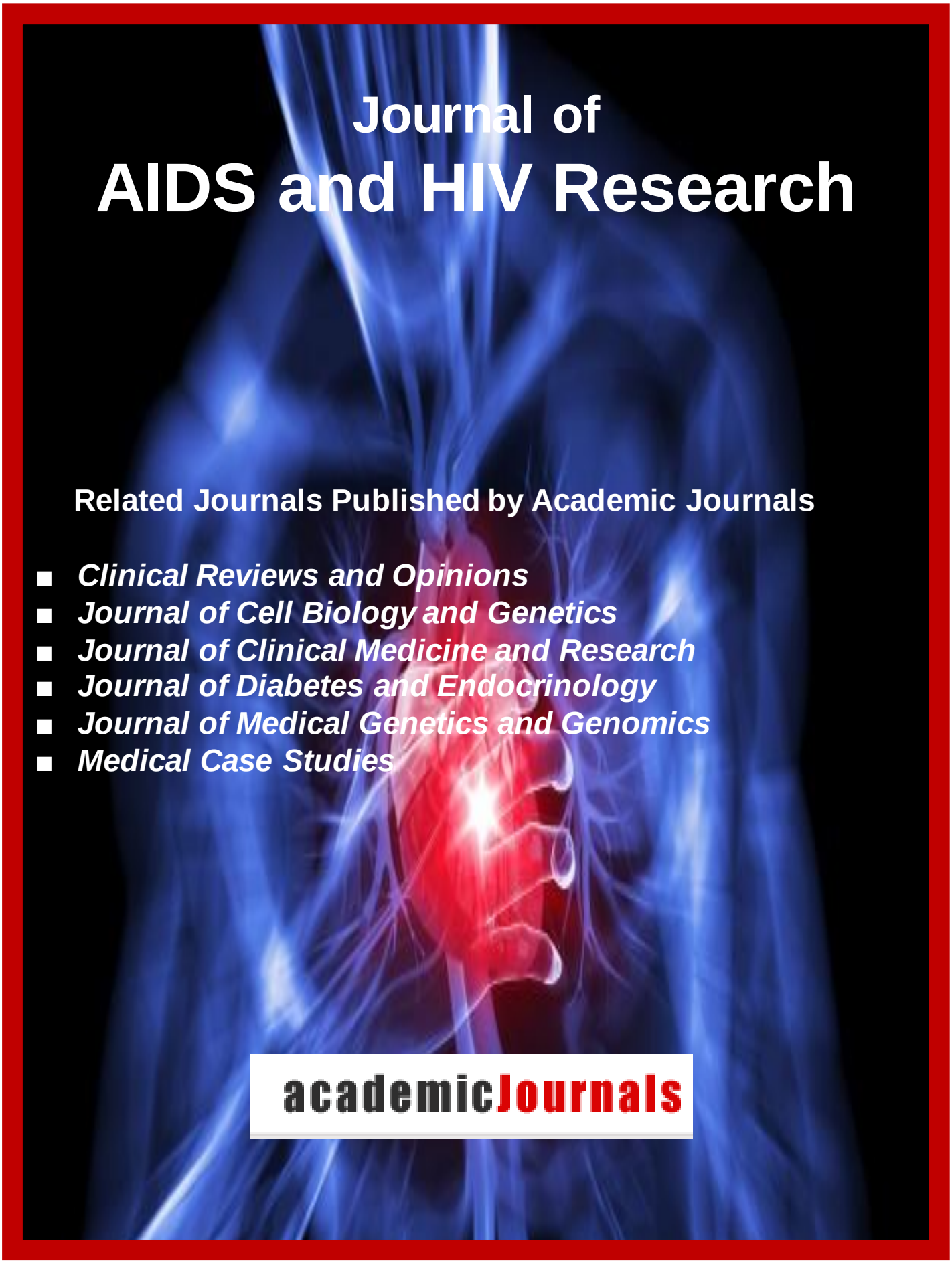

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