Arch Iranian Med 2007; 10 (3): 335 – 338

Original Article

Renal Disorders in HIV-Infected Patients

Shirin Afhami MD•*, Mehrnaz Rasoulinejad MD**, Effat Razeghi MD***, Sogol Shahriari MD†, Negin Esmailpour MD*

Background: **HIV infection affects all body organs including kidney. Since the frequency of HIV-related renal disorders is unknown in Iran and the number of HIV-infected patients is increasing, this study was conducted for the first time in Iran to assess the frequency of electrolyte imbalance, renal failure, and proteinuria among HIV-infected patients.**

Methods: **Between April and December 2005, 65 HIV-infected patients who were receiving care at an outpatient counseling center in Tehran, participated in this study. Blood samples were collected to measure serum levels of sodium, potassium, calcium, phosphorus, blood urea nitrogen, and creatinine. Urine samples were analyzed to detect protein, red blood cells, white blood cells, and cast.**

Results: **Of the 65 HIV-infected patients, 86.2% were males. The mean age of the patients was 37 ± 8.7 years, and 58.5% of the patients had a history of injecting illicit drugs. Urinalysis was normal in all patients, and serum levels of electrolytes, blood urea nitrogen, and creatinine were all in normal range.**

Conclusion: **We found no electrolyte imbalance, proteinuria, or renal failure in HIV-infected patients. It seems that renal disorder is infrequent in Iranian HIV-infected patients.**

Archives of Iranian Medicine, Volume 10, Number 3, 2007: 335 – 338.

Keywords: Electrolyte imbalance • HIV/AIDS • proteinuria • renal failure

Introduction

A spectrum of renal and electrolyte abnormalities has been described in HIV-infected patients.[1 – 4] These patients are frequently exposed to medications that can adversely affect renal function.[5 – 7] Having considered the continuous increase in HIV infection worldwide, renal abnormalities such as HIV-associated nephropathy are likely to become increasingly prominent.[8 – 11]

Major renal complications in HIV infection are a spectrum of disorders that result in potentially reversible acute renal failure, primarily acute tubular necrosis, and HIV-associated nephropathy, which leads to end-stage renal disease.[8, 9]

Approximately 14% of black patients and 6% of white patients who died from HIV infection in the United States in 1999 had renal disease.[12] As the mortality and morbidity of HIV infection have been changed in the last few years, especially in the highly active antiretroviral therapy (HAART) era, it is possible that the prevalence of renal abnormalities is also changing.[5] Because the frequency and nature of renal and electrolyte abnormalities vary considerably from center to center,[5, 13, 14] and appropriate screening and intervention for renal diseases will reduce the morbidity and mortality of progressive renal diseases,[12] this study was conducted for the first time in Iran to assess the frequency of electrolyte abnormalities, renal failure, and proteinuria among HIV-infected Iranian patients.

Materials and Methods

This study was conducted from April through December 2005. Sixty-five HIV-infected patients

Authors' affiliations: Department of Infectious Disease, *Shariati Hospital, **Imam Khomeini Hospital, ***Department of Nephrology, Sina Hospital, †HIV/AIDS Research Center, Tehran University of Medical Sciences (TUMS), Tehran, Iran.
•**Corresponding author and reprints:** Shirin Afhami MD, Department of Infectious Disease, Shariati Hospital, North Karegar Ave., Tehran, Iran. Fax: +98-218-863-3039,
E-mail: afhami8@hotmail.com; afhamish@sina.tums.ac.ir.
Accepted for publication: 19 November 2006

who were receiving care at an outpatient counseling center affiliated to Tehran University of Medical Sciences participated in this prospective prevalence study.

To determine the frequency of electrolyte and renal abnormalities including renal failure and proteinuria among HIV-infected patients, written consent was obtained and blood samples were collected to measure serum creatinine, blood urea nitrogen, sodium, potassium, calcium, and phosphorus. A urinalysis was done using reagent strips (Kimia Pajouhan Co., Tehran, Iran).

Data on age, sex, injection of illicit drugs, duration of HIV infection, disease stage, history of opportunistic infection such as *Cytomegalovirus* (CMV) or *Pneumocystis jiroveci*, receipt of nephrotoxic drugs including antiretroviral agents, CD4 cell count, and HIV- hepatitis C virus (HCV) coinfection were collected. Duration of HIV infection was defined as the time elapsed from HIV-positive test result; disease stage was classified according to Centers for Disease Control and Prevention (CDC) definitions for HIV infection/AIDS; and HAART was defined as use of three antiretroviral drugs.

Hyponatremia and hypernatremia were defined as serum sodium level <135 and >145 meq/L, respectively; hypo- and hyperkalemia were defined as serum potassium level <3.5 and >5 meq/L, respectively; hypo- and hypercalcemia were defined as serum calcium level <8.5 and >10.5 mg/dL, respectively; hypo- and hyperphosphatemia were defined as serum phosphorus level <3 and >5 mg/dL, respectively; abnormal urinalysis was defined as urine RBC>3/HPF[1] or positive cast or protein; proteinuria was defined as urine protein> +1 in urinalysis; and renal failure was defined as an increase in serum creatinine level more than 30% of basal level, or blood urea nitrogen>20 mg/dL and serum creatinine level>1.3 or >1.5 mg/dL in females and males, respectively.

Demographic and laboratory data were analyzed using SPSS software, version 11. Continuous variables were expressed as mean ± SD.

Results

Of the 65 HIV-infected patients, 86.2% were males, and the mean age of the patients was 37 ± 8.7 years (range: 17 – 59 years). History of injecting illicit drugs was positive in 58.5 % of the patients, and 58.2% of the patients were concomitantly infected with HCV. None of the patients had a history of opportunistic infection with CMV or *Pneumocystis jiroveci*.

In all patients, urinalysis was normal and serum levels of sodium, potassium, calcium, phosphorus, creatinine, and blood urea nitrogen were in normal range. Tables 1 and 2 show demographic and laboratory data of the 65 HIV-infected patients.

Because there was no abnormality in results of laboratory data, other complementary investigations such as collection of 24-hour urine protein, imaging, and renal biopsy were not done.

Discussion

We found no electrolyte abnormality, renal failure, or proteinuria among 65 HIV-infected patients. Renal parenchymal, fluid, and electrolyte abnormalities may complicate hospitalization in 20% of patients.[11, 15] HIV-specific renal abnormalities are being defined, but most follow opportunistic infection or drug nephrotoxicity.[15] In the study conducted by Rao on 750 patients with AIDS in New York City from 1982 through 1986, 10.4% of the patients needed further evaluation for renal disorders.[9] Ahuja et al screened 557 HIV-infected patients, and found proteinuria in 38 patients; the overall prevalence of HIV-associated

Table 1. Demographic data and CD4 cell count of 65 HIV-infected patients.

Characteristic	Value
Mean age ± SD (yr)	37 ± 8.7
Sex:	
Male / Female (%)	86.2 / 13.8
Injection of illicit drugs (%)	58.5
Mean time from diagnosis of HIV ± SD (yr)	3.3 ± 3
Disease stage: asymptomatic (%)	83.1
Receipt of nephrotoxic drugs including antiretroviral agents (%)	38.5
Mean CD4 cell count ± SD (cells /mm^3)	367.6 ± 219.5
CD4 cell count≤ 200 cells/mm^3 (%)	26.1
HCV coinfection (%)	58.2

Table 2. Laboratory data of 65 HIV-infected patients.

Characteristic	Mean ± SD	Range
Serum creatinine (mg/dL)	0.8 ± 0.2	0.4 – 1.1
Serum BUN* (mg/dL)	13.4 ± 3.2	7–19
Serum sodium (meq/L)	139.7 ± 2.3	135 – 142
Serum potassium (meq/L)	4.3 ± 0.3	3.6 – 4.9
Serum calcium (mg/dL)	9.6 ± 0.5	8.6 – 10.3
Serum phosphorus (mg/dL)	3.8 ± 0.7	3.2 – 4.7

*BUN=blood urea nitrogen.

nephropathy was 1.79%.[13] In another study, Szczech et al evaluated 2057 HIV-infected women in the USA and reported proteinuria in 32% of the patients.[16] Gardner et al found that less than 10% of a cohort of HIV-infected women had proteinuria or renal insufficiency at baseline, but 14% developed kidney disease during a mean 21-month follow-up.[17] Fluid-electrolyte and acid-base derangements, frequently encountered in AIDS, are major risk factors for the development of acute renal failure.[9]

We found no renal failure, HIV-associated nephropathy, electrolyte disorder in our study, which can be explained by the following reasons. In many studies, the patients referred for nephrology consultation or hospitalized patients were evaluated for HIV-associated nephropathy; in some other studies, most patients with AIDS and renal failure were included, or HIV-associated nephropathy was diagnosed at autopsy study.[10, 13, 14, 18, 19] In other study, periodic prevalence of renal disease was detected.[17] In contrast, we studied general HIV-infected population for a short period of time in an outpatient center. None of our patients had a positive history of opportunistic infection (CMV, *Pneumocystis jiroveci*); thirty-eight point five percent received nephrotoxic drugs including antiretroviral agents; and none had fluid-electrolyte derangement as major risk factors for the development of acute renal failure.

All of the 65 patients in our study had Iranian nationality, and none were black. HIV-associated nephropathy occurs predominantly in African-American patients.[1] Ahuja et al found that HIV-associated nephropathy is confined to African-Americans.[13] Mazbar et al also found that black race is a risk factor for HIV-associated nephropathy, and renal disease in illicit drug injectors occurs largely in blacks.[19] A total of 81 Latino and African-American patients with AIDS in an inner city hospital were studied retrospectively by Peter to determine the frequency of electrolyte disorders and renal dysfunction.[4] Of these 81 patients, 28.4% had hyponatremia, 17.3% had hypokalemia, and 4.9% had hyperkalemia without renal failure. Five (6.2%) patients had renal failure; four of them were Latino.

Low CD4 cell count (≤ 200 cells /mm³) has been known as a predisposing factor of proteinuria in HIV-infected patients.[16] In one study, all patients with HIV-associated nephropathy had CD4 cell count less than 200 cells/mm³.[10] The mean CD4 cell count was 367 cells/mm³ in our study, and CD4 cell count ≤200 cells/mm³ was only in 26.1% of our patients.

In summary, the difference in the results of our study with the others can be due to some reasons and limitations including evaluation of small sample size at an outpatient setting, nonblack ethnicity, higher CD4 cell count, short-term follow-up of the patients, and recent acquisition of HIV infection (in 56.9% of the patients for ≤2 years). Also in our study, most of the HIV-infected patients were asymptomatic.

We concluded that HIV-associated nephropathy, proteinuria, and electrolyte disorders are not frequent in Iranian HIV-infected population. Further studies with larger sample sizes are needed to assign the frequency of renal and electrolyte disorders among HIV population, especially in those with long duration of HIV infection or progressive infection. For better evaluation, long-term follow-up of our patients is also necessary.

Acknowledgment

This study has been supported by Tehran University of Medical Sciences. We thank Mrs. Sourati who was involved in collecting the blood samples.

References

1 Berggren R, Batuman V. HIV-associated renal disorders: recent insights into pathogenesis and treatment. *Curr HIV/AIDS Rep.* 2005; **2:** 109 – 115.

2 Izzedine H, Launay-Vacher V, Isnard-Bagnis C, Deray G. Antiviral drug-induced kidney and electrolytes disorders. *Minerva Urol Nefrol.* 2003; **55:** 157 – 172.

3 Perazella MA, Brown E. Electrolyte and acid-base disorders associated with AIDS: an etiologic review. *J Gen Intern Med.* 1994; **9:** 232 – 236.

4 Peter SA. Electrolyte disorders and renal dysfunction in acquired immunodeficiency syndrome patients. *J Natl Med Assoc.* 1991; **83:** 889 – 891.

5 Lu TG, Ross M. HIV-associated nephropathy: a brief review. *Mt Sinai J Med*. 2005; **72:** 193 – 199.

6 Gearhart MO, Sorg TB. Foscarnet-induced severe hypomagnesemia and other electrolyte disorders. *Ann Pharmacother*. 1993; **27:** 285 – 289.

7 Velazquez H, Perazella MA, Wright FS, Ellison DH. Renal mechanism of trimethoprim-induced hyperkalemia. *Ann Intern Med.* 1993; **119:** 296 – 301.

8 Glassock RJ, Cohen AH, Danovitch G, Parsa KP. Human immunodeficiency virus (HIV) infection and the kidney. *Ann Intern Med.* 1990; **112:** 35 – 49.

9 Rao TK. Acute renal failure syndromes in human immunodeficiency virus infection. *Semin Nephrol.* 1998; **18:** 378 – 395.

10 Winston JA, Klotman ME, Klotman PE. HIV-associated nephropathy is a late, not early, manifestation of HIV-1 infection. *Kidney Int*. 1999; **55:** 1036 – 1040.
11 Winston J, Klotman PE. HIV-associated nephropathy. *Mt Sinai J Med*. 1998; **65:** 27 – 32.
12 Kopp JB. Renal dysfunction in HIV-1-infected patients. *Curr Infect Dis Rep*. 2002; **4:** 449 – 460.
13 Ahuja TS, Borucki M, Funtanilla M, Shahinian V, Hollander M, Rajaraman S. Is the prevalence of HIV-associated nephropathy decreasing? *Am J Nephrol*. 1999; **19:** 655 – 659.
14 Seney FD Jr, Burns DK, Silva FG. Acquired immunodeficiency syndrome and the kidney. *Am J Kidney Dis*. 1990; **16:** 1 – 13.
15 Frankum BS, Savdie E. Managing HIV. Part 5: treating secondary outcomes. 5.10 HIV and renal disease. *Med J Aust.* 1996; **164:** 483.
16 Szczech LA, Gange SJ, van der Horst C, Bartlett JA, Young M, Cohen MH, et al. Predictors of proteinuria and renal failure among women with HIV infection. *Kidney Int*. 2002; **61:** 195 – 202.
17 Gardner LI, Holmberg SD, Williamson JM, Szczech LA, Carpenter CC, Rompalo AM, et al. HIV Epidemiology Research Study Group. Development of proteinuria or elevated serum creatinine and mortality in HIV-infected women. *J Acquir Defic Syndr*. 2003; **32:** 203 – 209.
18 Hailemariam S, Walder M, Burger HR, Cathomas G, Mihatsch M, Binswanger U, et al. Renal pathology and premortem clinical presentation of Caucasian patients with AIDS: an autopsy study from the era prior to antiretroviral therapy. *Swiss Med Wkly*. 2001; **131:** 412 – 417.
19 Mazbar SA, Schoenfeld PY, Humphreys MH. Renal involvement in patients infected with HIV: experience at San Francisco General Hospital. *Kidney Int.* 1990; **37:** 1325 – 1332.