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Original Research Article

Study of the renal profile in relation to CD4 count in human immuno-deficiency virus patients from a tertiary centre of Bihar

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ABSTRACT

Background: Human immuno-deficiency virus (HIV)-positive individuals are at increased risk for kidney disease, including HIV-associated nephropathy (HIVAN). HIV peptides rather than infection may be more important in pathogenesis of HIVAN. Much has been learnt about the pathogenesis and treatment of HIV-associated renal diseases because of the development of animal models and the molecular evaluation of clinical samples.
Methods: We studied 90 consecutive patients with HIV and allocated them into 3 groups, each containing 30 patients on the basis of their CD4 counts. Then each group was divided into two subgroups, X and Y on the basis of whether they received anti-retroviral treatment (HAART) or not. Subgroup X received HAART and subgroup Y did not received HAART.
Results: There was male preponderance (M: F=5.4: 1). Microalbuminuria, increased serum creatinine and decreased GFR was highest among HIV patients having CD4 count below 200 as compared to those having CD4 count of 200-350 and above 350.
Conclusions: Our study demonstrates that both proteinuria and HIVAN are common in HIV infected patients. Proteinuria and glomerular filtration rate have a negative correlation with the CD4 count.

Keywords: Human immuno-deficiency virus, Nephropathy, Microalbuminuria

INTRODUCTION

Worldwide, an estimated 37 million people are living with human immuno-deficiency virus (HIV) infection, and more than two million new infections are diagnosed annually.[1] HIV-positive individuals are at increased risk for kidney disease, including HIV-associated nephropathy, collapsing focal segmental glomerulosclerosis, immune-complex kidney disease, and co morbid kidney disease, as well as kidney injury resulting from prolonged exposure to antiretroviral therapy or from opportunistic infections.[2] Much has been learnt about the pathogenesis and treatment of HIV-associated renal diseases because of the development of animal models and the molecular evaluation of clinical samples. Although the pathogenesis of HIV-associated nephropathy is clearly linked to the viral illness, over the next decade we must determine how infection results in the development of disease. HIV peptides rather than infection may be more important in pathogenesis of renal disease. Genetic factors, the host response, and effects of HIV peptides on podocytes, on renal cellular apoptosis, and on the ability to present antigen may be critical to pathogenesis. Although highly active antiretroviral therapy will play an important role in preventing and treating HIV-associated nephropathy, well-designed and controlled clinical trials are necessary to determine the roles of therapy with glucocorticoids and angiotensin converting enzyme (ACE) inhibitors.[3] The

aim of the study was to find out the effect of HIV infection on renal function in relation to CD4 count.

METHODS

Present study was conducted at Sri Krishna Medical College and Hospital, Muzaffarpur, India, a tertiary care centre during January 2020 to January 2022. It was a prospective cross-sectional study. Ethical approval was taken from competent authority prior to start of the study. A total of 90 consecutive patients with diagnosis of HIV-1 by enzyme-linked immunosorbent assay (ELISA) either admitted in ward or in outpatient department were selected as cases and allocated into 3 groups, each containing 30 patients on the basis of their CD4 counts.

Group A (n=30) with CD4 count more than 350, group B (n=30) with CD4 count between 350-200 and group C (n=30) with CD count below 200. Then each group was divided into two subgroups, X and Y on the basis of whether they received anti-retroviral treatment (HAART) or not. Subgroup X received HAART and subgroup Y did not received HAART.

Inclusion criteria

The cases were selected who were diagnosed with HIV positive and were under HAART therapy as per NACO guidelines. Relevant history, thorough physical check-up and biochemical tests were done to rule out any pre-existing acute or chronic renal problem in the selected patients.

Exclusion criteria

The study excluded the patients having diabetes, hypertension, pregnancy or previous known renal disease so as to avoid the possibility of obscuring the findings as well as results of the study. Each patient had renal function tests done: blood urea, serum creatinine, 24 hours urinary albumin, spot urine albumin creatinine ratio (microalbuminuria test), CD4 count, glomerular filteration rate (GFR) using Cockcroft Gault formula.

In brief present study observed the renal functions in HIV positive patients who were free from any acute or chronic pre-existing renal disease. We had to find out the relationship in relation to CD4 count and renal function in patients with HIV. The correlation observed will be presented in "percentage form i.e. % comparing with available literature and studies". Statistical package for the social sciences (SPSS) 21.0 was used for statistical analyses. Patient's ages were described as mean±standard deviation. Continuous variables were compared by the t-test and dichotomous variables were compared by Fisher's exact test for two-by-two comparisons or Pearson $\chi 2$ for greater than two responses.

RESULTS

The present study was conducted at medicine department/ART Centre of Sri Krishna Medical College and Hospital, Muzaffarpur, India. A total of 90 patients diagnosed with HIV positive, and divided into 3 groups on the basis of CD4 count, further dividing each of them into subgroups on the basis of whether taking HAART or not. Observing the renal functions in each group and subgroups and finding the valid relationship. The observation and results are as follows: group A=CD4 count >350/dl, group B=CD4 count between 200-350/dl, and group C=CD4 count <200/dl.

Each group contain subgroup x=patients taking HAART and subgroup y=patients not taking HAART. Demography and different parameters of patients shown in Tables 1 and 2. Comparison of group A, B and C on the basis of GFR done in Tables 3 and 6. Patients with positive microalbuminuria test and serum creatinine less than 1.4 mg/dl in different groups like A, B and C shown in Figures 1 and 2 along with Tables 4 and 5.

Table 1: Demography.

Group A	Total no. of patients	Male	Female	Percentage of patients from each sex
CD4 count >350/dl	30	26	4	M-86.67, F-13.33
CD4 count 200-350/dl	30	25	5	M-83.33, F-16.67
Group A CD4 count <200/dl	30	25	5	M-83.33, F-16.67

Male: M, female: F

Table 2: Parameters of patients in different groups.

Group	Average age male (years)	Average age female (years)	Average weight (male)/kg	Average weight (female)/kg	Mean CD4 count/dl (male)	Mean CD4 count/dl (female)	Percentage of male taking HAART	Percentage of female taking HAART
A	34	25	55	44	423	425		0
B	30	32	53	43	276	250	20	20
C	29	25	45	40	86	96	48	40

Table 3: Comparison of percentage of patients having (GFR >60 ml/min to GFR <60 ml/min/1.73 m^2 body surface area) irrespective of sex in each group.

Group	GFR value in ml/min		Total	Percentage of <60 ml/min
	>60	<60		
A	22	8	30	26.67
B	16	14	30	46.67
C	5	25	30	80.33
Total	43	47	90	

Table 4: Microalbuminuria test.

Group	Microalbuminuria test		Total	Percentage of microalbuminuria test positive	P value
	Positive	Negative			
A	4	26	30	13.33	0.077
B	5	25	30	16.67	0.0735
C	16	14	30	53.33	0.0018
Total	25	65	90		

Table 5. Comparison of percentage of patients having (serum creatinine >1.4 mg/dl) irrespective of sex in each group.

Group	S. creatinine (mg/dl)		Percentage of patients having serum creatinine <1.4 mg/dl	P value
	<1.4	>1.4		
A	8	22	23	0.1081
B	12	18	40	0.9025
C	18	12	60	0.0354
Total	38	52		

Table 6: Comparison of percentage of patients having (GFR >60 ml/min to GFR <60 ml/min/1.73 m^2 body surface area) irrespective of sex in each group.

Group	GFR value in ml/min		Total	Percentage of patients having GFR <60 ml/min	P value
	>60	<60			
A	22	8	30	26.67	0.510
B	16	14	30	46.67	0.544
C	5	25	30	80.33	0.0006
Total	43	47	90		

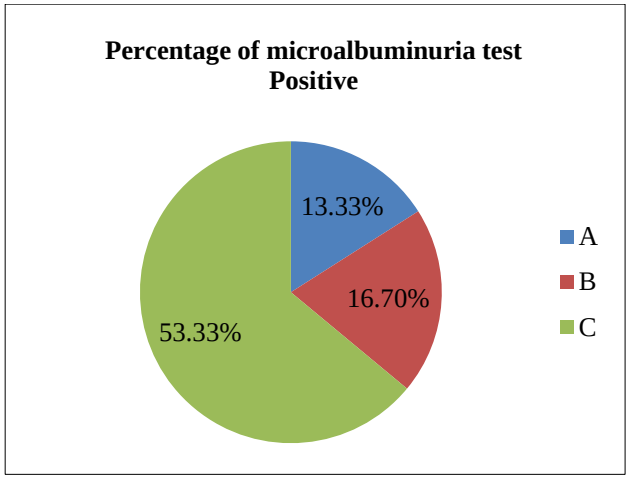

Figure 1: Percent of patients with positive microalbuminuria test.

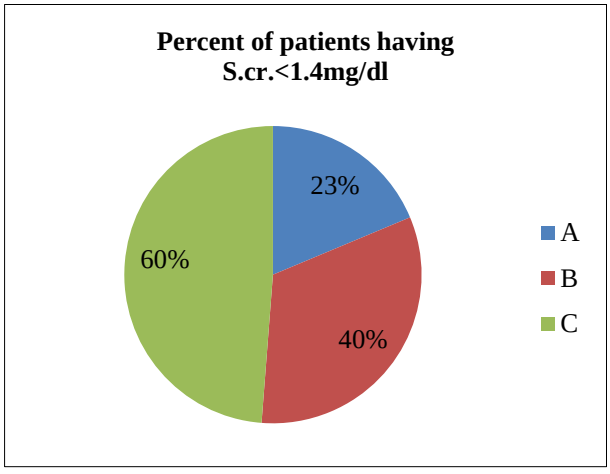

Figure 2: Percent of patients having serum creatinine<1.4 mg/dl.

DISCUSSION

HIV infection has become a well-defined pandemic nowadays, involving each and every socio-economic stratum of society. Spread of disease is rapid due to changing living habits, sexual habits and occupational hazard in laboratory medics and paramedics. Though the disease involves in its course almost each and every organ system of human body, involvement of renal system is an important one. Initially it was thought that kidney involvement was not a major complication of HIV infection but in due course a broad spectrum of renal disease has been reported in patients with HIV.[2] Carbone et al studied about the course and prognosis of HIVAN and found that focal segmental glomerulosclerosis has poor prognosis leading to ESRD in due course of time.[3]

The classic kidney disease of HIV infection, HIV-associated nephropathy, is characterized by progressive acute renal failure, often accompanied by proteinuria and ultrasound findings of enlarged, echogenic kidneys. Definitive diagnosis requires kidney biopsy, which demonstrates collapsing focal segmental glomerulosclerosis with associated microcystic tubular dilatation and interstitial inflammation.[4] Those with focal glomerulosclerosis typically demonstrated heavy proteinuria without edema or hypertension and progressed rapidly to renal failure in less than 1 year from the time of discovery.[5] A study by Emem et al concluded that the prevalence of proteinuria in HIV-seropositive patients is high in Nigeria. The risk factors for renal disease included severity of the HIV infection (inferred from the generally low CD4+ count), anaemia, malnutrition and increasing age.[6] Bruggeman et al demonstrated a direct effect of transgene expression on the development of HIVAN in the mouse and suggested that in humans, a direct effect of HIV-1 expression is likely the essential cause of HIVAN, rather than an indirect effect of cytokine dysregulation.[7] Atta et al stated that the HAART has a definite beneficial role in the treatment of HIV-associated nephropathy.[7]

Another similar study by Ahuja et al stated the beneficial role of HAART in HIV positive patients on hemodialysis.[8] The present study observes the renal function in HIV positive patients in relation to CD4 counts on the basis of certain parameters and establishes the relationship that how decreased level of CD4 count adversely affects renal function. The demography (Table 1) in group A, out of 30 patients, 26 (86.67%) were male and 4 (13.33%) female with mean age (±SD) was 34 (±7.67) years for male and 25 (±0.84) years for female in group B out of 30 patients 25 (83.33%) were male and 5 (16.67%) female with mean age (±SD) was 30 (±8.47) years for male and was 32 (±9.11) years for female. In group C out of 30 patients 25 (83.33%) were male and 5 (16.67%) females with mean age (±SD) was 29 (±8.86) years for male and was 25 (±6.54) years for female. The data shows the prevalence of disease is more in men. The age pattern is indicative of HIV incidence more in reproductive and sexually active age. The CD4 count in group A for male is 423±52.69/dl and female 425±50.04/dl. In group B for male 276±48.46/dl and for female 261±44.21/dl. In group C for male 86±48.95/dl and for female 94±44.80/dl. HIVAN is the most common finding on renal biopsy in HIV infected patient, and is also the commonest cause of end stage renal disease in these patients.

In present study the microalbuminuria in group A: out of 30 patients, microalbuminuria test was positive in 4 (13.33%) of patients and was negative in 86.67% of patients with p value 0.077. In group B: out of 30 patients, microalbuminuria test was positive in 5 (16.70%) and was negative in 25 (83.30%) of patients with p value 0.0735. In group C: out of total 30 patients, microalbuminuria test was positive in 16 (53.33%) of patients and was negative in 14 (46.67%) of patients with p value 0.0018. In group A and B the p value was not significant but in group C it was significant. In the study microalbuminuria was detected in a total of 25 (28%) of 90 patients studied from each group. A similar study by Han et al found 24% patients with microalbuminuria.[9] Data were comparable with other studies.[10]

A study by Chander et al suggest a high prevalence of kidney disease among HIV-infected individuals in sub-Saharan Africa, ranging from 6% among Kenyan patients without other risk factors for kidney disease, to as high as 38% in a Nigerian cohort.[11] Connaldi et al studied the role of mesangial cell cytokine activation in cases with persistent HIV infections leading to glomerulosclerosis in HIV patients.[12] Gardenswartz et al stated that renal involvement was seen to be common in Indian patients with HIV. Proteinuria and elevated serum creatinine could be an early marker of HIV associated renal lesions and screening for their presence may be beneficial. Renal biopsy is considered beneficial in seropositive patients with proteinuria especially with low CD4 count for early diagnosis and treatment of renal lesion.[13] Katz et al studied about the rare IgA nephropathy in HIV patients.[14] Kirchner et al studied about the beneficial role of HAART on the decline of nephropathy in HIV patients.[15] Patients were not followed up, so the final prognosis can't be ascertained. This was the limitations of our study.

CONCLUSION

Involvement of renal system is now established and common complication of HIV infection or full-blown AIDS. All the patients infected with HIV at the time of evaluation, even in the absence of clinical symptoms, should undergo diagnostic tests for CD4 count, microalbuminuria test/24 hours urinary protein, serum creatinine level, blood urea level. If microalbuminuria test, serum creatinine, GFR or blood urea found to be abnormal in the absence of any pre-existing renal disease, patients should be further tested with ultrasound abdomen and kidney biopsy to establish the diagnosis of different renal syndromes in HIV. Because the incidence of renal syndrome is high in patients having lower CD4 count early diagnosis and treatment destined to aim the renal disease

as well as institution of anti-retroviral treatment improves the prognosis. Therefore, early recognition and prompt treatment of renal disease in HIV patients reduce the morbidity and mortality of patients specially having low CD4 count level.

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REFERENCES

1. UNAIDS. AIDS info, 2017. Available at: http://aidsinfo.unaids.org/. Accessed on 19 July 2017.
2. Rao TK, Filippone EJ, Nicastri AD, Landesman SH, Frank E, Chen CK, et al. Associated focal and segmental glomerulosclerosis in the acquired immunodeficiency syndrome. N Engl J Med. 1984;310(11):669-73.
3. Carbone L, D'Agti V, Cheng JT, Appel GB. Course and prognosis of human immunodeficiency virus-associated nephropathy. Am J Med. 1989;87:389-95.
4. Bourgoignie JJ, Meneses R, Ortiz C, Jaffe D, Pardo V. The clinical spectrum of renal disease associated with human immunodeficiency virus. Am J Kidney Dis. 1988;12(2):131-7.
5. Emem CP, Arogundade F, Sanusi A, Adelusola K, Wokoma F, Akinsola A. Renal disease in HIV-seropositive patients in Nigeria: an assessment of prevalence, clinical features and risk factors. Nephrol Dial Transplant. 2008;23(2):741-6.
6. Bruggeman LA, Dikman S, Meng C, Quaggin SE, Coffman TM, Klotman PE. Nephropathy in human immunodeficiency virus-1 transgenic mice is due to renal transgene expression. J Clin Invest. 1997;100:84-92.
7. Atta MG, Gallant JE, Rahman MH, Nagajothi N, Racusen LC, Scheel PJ, Fine DM. Antiretroviral therapy in the treatment of HIV-associated nephropathy. Nephrol Dial Transplant. 2006;21:2809-13.
8. Ahuja TS, Borucki M, Grady J. HAART improves survival of HIV-infected hemodialysis patients. Am J Kidney DS. 2000;36:574-80.
9. Han TM, Naicker S, Ramdial PK, Assounga AG. A cross-sectional study of HIV-seropositive patients with varying degrees of proteinuria in South Africa. Kidney Int. 2006;69(12):2243-50.
10. Gupta V, Gupta S, Sinha S, Sharma SKA, Dind SK. HIV associated renal disease: A pilot study from north India. Indian J Med Res. 2013;137(5):950-60.
11. Chander P, Soni A, Suri A, Bhagwat R, Yoo J, Treser G. Renal ultrastructural markers in AIDS-associated nephropathy. Am J Pathol. 1987;126:513-26.
12. Conaldi PG, Bottelli A, Wade-Evans A, Biancone L, Baj A, Cantaluppi V, et al. HIV-persistent infection and cytokine induction in mesangial cells: a potential mechanism for HIV-associated glomerulosclerosis. AIDS. 2000;14(13):2045-7.
13. Gardenswartz MH, Lerner CW, Seligson SR, Zabetakis PM, Rotterdam H, Tapper ML, Michelis MF, Bruno MS. Renal disease in patients with AIDS: a clinicopathologic study. Clin Nephrol. 1984(21):197-204.
14. Katz A, Bargman JM, Miller DC, Guo JW, Ghali VS, Schoeneman MJ. IgA nephritis in HIV-positive patients: a new HIV-associated nephropathy? Clin Nephrol. 2001;25:97-104.
15. Kirchner JT. Resolution of renal failure after initiation of HAART: 3 cases and a discussion of the literature. AIDS Read. 2002;12:103-5.

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