

ORIGINAL RESEARCH ARTICLE

A STUDY OF RENAL FUNCTION ABNORMALITIES IN PATIENTS WITH HIV INFECTIONS/AIDS

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Abstract

Background and Objective: To ascertain the renal system's functioning in individuals with HIV/AIDS.

Methods: The cross-sectional, analytical, and documentary examination of one hundred individuals undergoing antiretroviral medication and testing positive for the human immunodeficiency virus were performed. The patients were also examined for elevated serum creatinine levels and urine elements and sediments.

Results: Less than 90 ml/min/1.73 m² was the glomerular filtration rate in 10.4% of the subjects. Renal dysfunction was present in 6.0% of individuals in stage 2 and 2.6% in stage 3. Older age and extended antiretroviral medication exposure were statistically significant factors that changed renal function.

Conclusion: Glomerular filtration rate estimates using the Chronic Kidney Disease Epidemiology method when antiretroviral medication is used to treat patients with HIV/AIDS, the collaboration equation has shown to be a useful tool for early identification of renal function deterioration.

Keywords: HIV infection, renal function abnormalities, AIDS, glomerular filtration rate.

Introduction

Since 1996, more people have had access to highly effective antiretroviral therapy; in 2015, 455,000 individuals were enrolled in this treatment for HIV/AIDS. The treatment has significantly improved the lives of those living with HIV/AIDS by reducing hospitalizations, opportunistic complications, and mortality related to the virus [1, 2, 3]. However, long-term drug use in HIV-positive patients has been associated with toxic effects on renal cells. This can result in a variety of renal dysfunction mechanisms, including nephrolithiasis, intratubular drug deposition, crystaluria, hematuria, renal atrophy, acute interstitial nephritis, and acute and chronic renal failure. Chronic kidney disease is thought to affect 17.0% of HIV-positive individuals. This condition may be linked to prolonged use of certain antiretroviral medications, advanced infection, high viral load, low CD4 + T cell count, vascular problems, metabolic disorders, and race black people [4, 5, 6]. Compared to individuals with normal renal function, people with declining renal function are more likely to have had antiretroviral medication. Monitoring the glomerular filtration rate is thought to be the best indicator of renal function in both healthy and ill people because it may be used to determine the appropriate course of treatment and prevent the development of renal disease to its ultimate stage before signs of renal failure appear. The use of formulas based on serum creatinine to estimate the rate of glomerular filtration is encouraged in a recent

publication by the Department of Health about the evaluation of renal function. The goal was to assess renal function in patients receiving antiretroviral therapy, categorize the extent of renal function impairment in those individuals, and identify potential risk factors for changes in glomerular filtration rate, among other changes in glomerular filtration rate that may be brought on by HIV infection and/or the use of antiretroviral therapy [7, 8, 9].

Material and Method

A cross-sectional investigation conducted in Department of general medicine, Aditya Hospital, jangoan, Telangana, India from February 2023 to January 2024. A sample of 100 participants was analyzed out of the 450 patients who received assistance from the specialized care service. Data on specific risk factors for the development of chronic kidney disease in people living with HIV/AIDS were gathered after the patients signed the informed consent form. These included clinical laboratory data such as viral load, CD4 + T lymphocyte counting, urine summary and health history (hypertension, diabetes mellitus), family history, and race, in addition to other factors considered as general risks, such as old age, smoking, chronic infection, and anthropometric data such as weight (kg) and height (m) [10, 11].

Inclusion criteria

Patients who are 18 years of age or older, enrolled in the specialized care program, and who have been continuously receiving antiretroviral medication for more than six months.

Exclusion criteria

Individuals with long-term renal illness before being diagnosed with HIV.

Result

Table 1: Estimated Glomerular Filtration Rate of Patients Receiving Antiretroviral Therapy Registered in the Specialized Care Service

Stages	GFR (ml/min/1.73m ²)	n (%)	CR 95%
1 - Normal or high	≥ 90	91 (91)	83.6-93.8
2 - Slight decrease	60-89	6 (6)	3.7-12.3
3a - Slight and moderate decrease	45-59	2 (2)	0.1-5.1
3b - Moderate and severe decrease	30-44	1 (1)	-0.6-2.0
4 - Serious decrease	15-29	--	--
5 - Renal failure	<15	--	--

Table 2: This study examines the relationship between social demographic factors and glomerular filtration rate among patients receiving care at the Service of Specialized Care

Variables	Glomerular Filtration Rate			p
	30 to 59 n (%)	60 to 89 n (%)	≥90 n (%)	
Gender				0.338*
Male	1 (16.0)	3 (24.0)	66 (62.9)	
Female	3 (36.0)	4 (40.0)	53 (50.1)	

Age (years)				0.002*
18 to 29	-	1 (6.2)	13 (11.0)	
30 to 39	1 (20.0)	-	46 (32.6)	
40 to 49	-	5 (45.0)	39 (25.1)	
50 to 59	1 (35.0)	1 (14.5)	22 (15.0)	
>60	2 (36.0)	3 (22.0)	6 (3.8)	
Color				0.521*
White	-	1 (6.8)	15 (10.0)	
Dark Skin	3 (67.0)	8 (73.3)	85 (56.3)	
Yellow	-	1 (7.6)	4 (2.7)	
Black	1 (18.0)	-	14 (11.0)	
Schooling				0.066*
No schooling	1 (18.0)	2 (21.0)	15 (14.3)	
1st to 4th grade	2 (75.0)	5 (51.3)	32 (24.6)	
5th to 9th grade	-	1 (15.7)	45 (34.1)	
High school	-	-	17 (15.8)	
University	-	-	2 (2.3)	

Table 3: The present study investigates the correlation between treatment duration and renal function among individuals diagnosed with HIV/AIDS who are registered in the Service of Specialized Care

Treatment time (years)	Renal Function (ml/min/1.73m ²)		p
	n (%)	n (%)	
<1	1 (1.8)	12 (7.4)	0.032*
1 to 2	1 (4.9)	31 (23.2)	
3 to 4	2 (16.8)	23 (14.5)	
5 to 6	2 (16.8)	25 (18.6)	
7 to 8	2 (16.8)	18 (12.3)	
9 to 10	1 (4.9)	7 (4.5)	
>10	3 (21.2)	3 (1.5)	

Discussion

The study's assessment of the glomerular filtration rate from a single serum creatinine test was constrained by the requirement for a new evaluation to be conducted within a six-month timeframe. Hence, it is recommended to conduct more research that can conduct periodic evaluations and examine the temporal fluctuations in renal filtrate measurement. The authors propose that it is feasible to scrutinize the evident aspects in view of the findings. Given the lack of statistically significant findings from the urine sediment screening conducted in the trial, it may be necessary to consider alternate indicators for older patients. 11.3% of the study individuals had a glomerular filtration

rate below 90 ml/min/1.73 m. Nevertheless, the observed percentage frequency was comparatively lower than the 16.4% reported in the study employing the CKD-EPI measurement, which was performed on a cohort of 1970 individuals undergoing antiretroviral treatment. However, it is equal to considering a glomerular filtration rate of 3.1%, which falls between the range of 30 to 59 ml/min/1.73 m²[12,13]. In a research conducted by the Santa Casa de Vitória, Espírito Santo, Brazil, it was shown that 9.8% of patients who participated in the simplified Modified Diet in Renal Disease program exhibited a glomerular filtration rate below 60 ml/min/1.73 m². However, according to the Cockcroft-Gault (CG) calculation, this percentage should have been 6.7%. There were a total of 254 patients in the research. The observed divergence in values can be attributed to the distinct methodologies employed and the attributes of the diverse populations. In accordance with a consensus pertaining to the care of renal disease in individuals infected with HIV, the objective of standardizing methods for measuring serum creatinine is to reduce its variability and therefore enhance the accuracy of estimating the glomerular filtration rate [13, 14]. The CKD-EPI equation is widely regarded as the most precise mathematical expression for quantifying renal filtration. In the assessment of renal function, serum creatinine-based parameters, including age, gender, and race, have demonstrated their reliability as a dependable technique. This resource provides guidance on the appropriate administration of antiretroviral medications according to renal function classifications, and can be used to the food and pharmaceutical sectors [14].

Despite the lack of statistical significance observed in the study group, it is imperative to consider the impact of obesity and smoking on renal function in HIV/AIDS patients in order to ensure its preservation. The prevalence of renal impairment has increased within this demographic following HIV infection and the ongoing administration of certain antiretroviral medications. Chronic renal illness necessitates constant monitoring of two intermediate risk factors, namely diabetes mellitus and hypertension [15, 16].

The extended lifespan resulting from the use of antiretroviral therapy was a contributing cause to the increased prevalence of seropositive cases among older individuals, in addition to the occurrence of first infections at later stages of life. There was a statistically significant ($p < 0.05$) change in glomerular filtration rate observed in individuals with both older age and longer duration of HIV exposure. Renal impairment is moderately related with diabetes, hypertension, and a TCD4 + lymphocyte count below 200 cells/mm², although the association is not considerable.

Antiretroviral therapy primarily aims to inhibit the viral load and sustain elevated levels of CD4 + T cells. From 2004 to 2014, a total of 61 individuals diagnosed with HIV who were receiving medical care at a facility located in southern Brazil underwent a kidney biopsy, with the exception of those who were undergoing transplantation or dialysis. The patients encountered renal complications. The study shown that individuals exhibiting a CD4 + T cell count of 200/mm² exhibited superior preserved renal function for an average duration of 25 months. This phenomenon served as a protective factor against the development of terminal renal disease or mortality [17, 18].

Out of the 91 patients in a complex observational research in Northern India, only 26 (or 28.6%) returned for further examination. The study revealed that 91 (17.3%) of the 526 HIV-positive individuals showed renal impairment, which was attributed to proteinuria or renal dysfunction. Out of all the patients, only 50.0% had proteinuria. In a study conducted in China, a sample of 538 individuals who were HIV-positive and not receiving treatment exhibited a prevalence rate of 12.2% for proteinuria, as assessed using 24-hour urine analysis, and 16.1% for chronic renal illness.

The discrepancy in proteinuria results can be attributed to the extended follow-up duration, which facilitated repeated evaluations, as well as the utilization of distinct diagnostic procedures in the relevant investigations. When examining the glomerular

filtration rate of 60 ml/min/1.73 m², it was observed that a longer period of HIV infection was associated with poorer renal function, along with other parameters. Individuals diagnosed with HIV/AIDS who are of advanced age and do not undergo antiretroviral therapy exhibit a heightened susceptibility to drug exposure, hence augmenting their likelihood of developing chronic genetic disorders as they progress in age and encountering the cumulative adverse effects associated with antiretroviral medications^[18, 19].

Despite extensive debate over the years over the association between antiretroviral therapy and modified renal function, the present investigation has determined that there is no correlation between the utilization of antiretroviral medications and changes in renal function. The introduction of new medications has led to a consistent reduction in viral load factor, which has consequently led to a decline in renal cholinergic disease and an enhancement in renal function. Nevertheless, specific antiretroviral drugs, such as tenofovir, have consistently been linked to toxic side effects and alterations in kidney function. Similarly, indinavir and cidofovir have been associated with kidney changes in cases of tubular diabetes characterized by Fanconi syndrome, nephrogenicity, diabetes insipidus, and renal tubular acidosis. The combination of tenofovir and atazanavir ri-tonavir resulted in a significantly decreased glomerular filtration rate throughout a 48-week duration compared to the combination of tenofovir and efavirenz, which consists of two antiretroviral medications. Nevertheless, the cross-referencing of therapeutic schemes in this experiment was hindered by the extensive number of relationships present in the sample being analyzed^[19].

Conclusion

However, the application of the CKD-EPI formula in assessing the glomerular filtration rate in patients with HIV/AIDS has proven to be effective in detecting compromised renal function at an early stage. Therefore, it is advisable to regularly apply this approach in clinical environments for all patients receiving antiretroviral medicine.

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