Ageing and Hypertension but not HIV Status Predict Kidney Dysfunction among Older Adults in Urban Tanzania: A Comparative Cross-Sectional Study

736

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BACKGROUND

- Adults living with HIV (ALHIV) have a three times increased risk of developing kidney disease compared to adults without HIV.
- In Tanzania, the prevalence of chronic kidney disease (CKD) in ALHIV ranges from 6.3% – 7.6%[1].
- Comorbidities that predispose to CKD include older age, hypertension, diabetes, obesity, and HIV factors.
- ALHIV with CKD experience accelerated progression to end-stage renal disease. Therefore, identifying factors associated with kidney dysfunction is essential to inform targeted interventions and screening strategies.

OBJECTIVE

- To compare the prevalence of different stages of kidney dysfunction between older Tanzanian adults with and without HIV and to determine the independent effect of HIV infection, relative to other risk factors, on mild-to-moderate or worse kidney dysfunction (eGFR <60 mL/min/1.73 m²).

METHODS

- **Study design:** Cross-sectional study among older adults (≥ 50 yrs) with (OALHIV) and without (AWoHIV) in Dar es Salaam, Tanzania.
- **Population:**
- **OALHIV:** Enrolled in the Tanzania HIV and Aging Longitudinal Cohort Study (THALCS) 4-7/24. Inclusion criteria: ≥50 years, on ART ≥3 years, enrolled in one of seven HIV CTCs ≥12 months.
- **AWoHIV:** Enrolled in the Dar es Salaam Urban Community Cohort Study (DUCS) 4-7/25. Inclusion criteria: ≥50 years, confirmed HIV-negative.
- Participants matched 1:1 by sex and five-year age strata.
- Exclusion criteria (both cohorts): pregnancy at enrollment or inability to provide informed consent.
- **Primary outcome:** Kidney dysfunction (eGFR < 60 mL/min/1.73 m^2).
- **Definitions:** Diabetes: FBG ≥7.1mmol/L and/or receiving anti-diabetic meds; Hypertension: BP ≥140/80 mmHg and/or receiving antihypertensives; Dyslipidemia: Total cholesterol ≥5.2 mmol/L, LDL-C ≥ 3.4 mmol/L, or HDL-C <1mmol/L for males, <1.3 mmol/L for females.
- **Statistical analyses:**
  Multivariable logistic regression analyses were used to identify factors associated with eGFR < 60 mL/min/1.73 m^2; eGFR was estimated from serum creatinine using the 2021 CKD-EPI equation[2].

Kidney dysfunction was common in older Tanzanian adults, independent of HIV status. Reduced eGFR is driven by ageing and co-morbidities rather than HIV, underscoring the need for routine screening and targeted strategies to prevent kidney function decline in these settings.

RESULTS

Table 1. Participant Characteristics

	AWoHIV (N=400)	OALHIV (N=400)	All (N=800)	P-value
Sex (n, % male)	190 (48%)	200 (50%)	390 (49%)	0.48
Age Cat				
50-59	239 (60%)	247 (62%)	486 (61%)	0.85
60-69	127 (32%)	121 (30%)	248 (31%)	
70+	34 (9%)	32 (8%)	66 (8%)	
BMI Cat				
Underweight (<18.5)	12 (3%)	25 (6%)	37 (5%)	0.16
Normal (18.5-24.9)	166 (42%)	168 (42%)	334 (42%)	
Overweight (25-29.9)	117 (30%)	110 (28%)	227 (29%)	
Obese (≥30+)	101 (26%)	93 (24%)	194 (25%)	
Duration on ART, yrs (median, IQR)		12 (IQR 8-16)	12 (IQR 8-16)	-
Tenofovir-containing ART (n, %)		333 (83%)	333 (83%)	-
HIV <50 copies/mL		287 (72%)	287 (72%)	-
Hypertension (n,%)	252 (63%)	218 (55%)	470 (59%)	**0.02**
Diabetes (n,%)	210 (53%)	121 (30%)	331 (41%)	**<0.01**
Dyslipidemia (n,%)	376 (95%)	354 (91%)	730 (93%)	0.06
Current smoker (n%)	35 (9%)	28 (7%)	63 (8%)	0.36
eGFR (mean mL/min/1.73 m² (SD))	78 (20%)	79 (21%)	78 (20%)	0.36
eGFR stage				
G1. Normal or high (eGFR≥90)	133 (34%)	146 (38%)	279 (36%)	0.63
G2. Mildly decreased (60-89)	193 (49%)	175 (46%)	368 (47%)	
G3a.Mildly to moderately decreased (45-59)	42 (11%)	42 (11%)	84 (11%)	
G3b.Moderately to severely decreased (30-44)	21 (5%)	15 (4%)	36 (5%)	
G4. Severely decreased (15-29)	6 (2%)	3 (1%)	9 (1%)	
G5. Kidney failure (eGFR: <15)	2 (1%)	3 (1%)	5 (1%)	

Figure 1. eGFR by HIV status and age

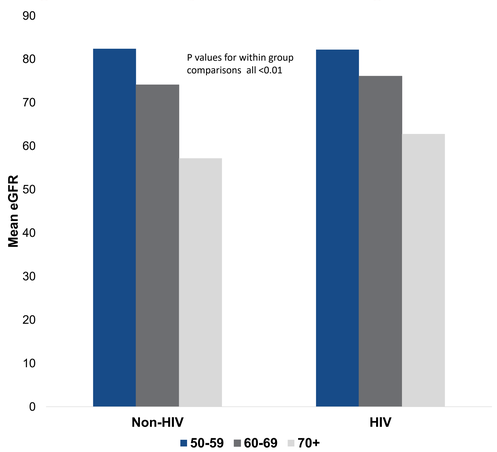


Table 2. Multivariate analysis of predictors of kidney dysfunction (eGFR < 60mL/min/1.73m²)

Variable	AOR (95% CI)	p-value
Male vs. Female (ref)	1.00 (0.64-1.57)	0.99
Age cat		
50-59	Ref.	-
60-69	1.62 (1.04-2.53)	**0.03**
70+	5.13 (2.80-9.47)	**<0.01**
Hypertension vs. none (ref)	1.73 (1.09-2.73)	**0.02**
Diabetes vs. none (ref)	1.07 (0.58-1.97)	0.83
BMI cat		
Normal	Ref.	-
Underweight	0.98 (0.34-2.78)	0.96
Overweight	0.84 (0.51-1.41)	0.52
Obese	1.60 (0.95-2.69)	0.08
Current smoker vs. not (ref)	2.00 (0.93-4.33)	0.08
HIV+ vs HIV- (Ref)	0.98 (0.65-1.48)	0.92

Estimates were adjusted for all variables included in the table, as well as alcohol use and health insurance coverage

CONCLUSIONS

- Kidney dysfunction was common among older adults, with nearly two-thirds of both older adults with and without HIV exhibiting mild-moderately reduced eGFR (G2) or greater.
- Age and age-related comorbidities rather than HIV itself were associated with eGFR <60 mL/min/1.73 m^2 contrary to other studies in sub-Saharan Africa where HIV is reported in association with kidney disease[3-5].
- This discrepancy may be due to differences in kidney disease definitions, eGFR equations, ART exposure, and comorbidity profiles.
- Our findings underscore the importance of routine screening and targeted management of age-related comorbidities to prevent or mitigate kidney dysfunction in aging populations.
- ➢ Longitudinal studies are needed to investigate casual relationships and guide targeted interventions for preserving kidney health in aging populations.

References

1.Mwemezi O, Ruggajo P, Mngumi J, Furia FF. Renal Dysfunction among HIV-Infected Patients on Antiretroviral Therapy in Dar es Salaam, Tanzania: A Cross-Sectional Study. Int J Nephrol. 2020
2.Delgado C, Baweja M, Crews DC, Eneanya ND, Gadegbeku CA, Inker LA, Mendu ML, Miller WG, Moxey-Mims MM, Roberts GV, St Peter WL, Warfield C, Powe NR. A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease. *Am J Kidney Dis*. 2022
3.Kavishe, B.B., Kweka, B.V., Nitsch, D. et al. Risk factors for impaired renal function in HIV-infected and HIV-uninfected adults: cross-sectional study in North-Western Tanzania. BMC Nephrol. 2021
4.Wyatt, C.M., Shi, Q., Novak, J.E. et al. Prevalence of Kidney Disease in HIV-Infected and Uninfected Rwandan Women. PLOS One 6. 2011
5.Ssemasaazi AJ, Kalyesubula R, Manabe Y. et al. High prevelance of kidney function impairment among older people living with HIV in Uganda. BMC Nephrol. 2024

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PLAIN LANGUAGE SUMMARY

Kidney problems were common in older Tanzanian adults, regardless of HIV status. Age and conditions like high blood pressure, obesity and smoking, rather than HIV, were the main causes, highlighting the importance of regular kidney check-ups and managing these health issues.

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