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Acquired Cystic Kidney Disease in Chronic Hemodialysis Patients: A Multicenter Study in Dakar

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Abstract

Introduction: The prevalence of acquired cystic kidney disease (ACKD) varies according to the duration of dialysis. Few studies are available on this subject in sub-Saharan Africa. The objective of this study was to determine its prevalence, define its clinical profiles and ultrasound characteristics, and identify factors associated with its development. **Patients and Methods**: This was a multicenter, cross-sectional, descriptive, and analytical study conducted over seven months in three hospitals in Dakar. Included were chronic hemodialysis patients aged 18 years or older, with a duration of dialysis exceeding three years, and in whom renal ultrasound revealed at least three acquired cysts in each kidney. **Results**: The prevalence of ACKD was 30.37%. The mean age of the patients was 51.49 ± 13.4 years, with a male-to-female ratio of 2.15. Hypertensive nephropathy was the most common nephropathy, accounting for 39.03% of cases. The average session duration was 3.93 ± 0.26 hours, and the frequency was 3 or 4 times per week. Lower back pain was present in 34.3% of patients, while no patient experienced episodes of macroscopic hematuria. The mean hemoglobin level was 10 ± 1.9 g/dL. Corticomedullary cysts were the most frequent, occurring in 46.34% of cases, followed by medullary cysts in 31.71%, with 21.95% of patients having cortical cysts. The mean number of cysts in the right kidney was 6.93 ± 3.72, and in the left kidney, the mean was 6.27 ± 3.03. The mean cyst size was 22 ± 8.06 mm. Factors associated with the development of ACKD included male sex, duration of dialysis (over 60 months), low diastolic blood pressure, low dose dialysis, and a hemoglobin level greater than 10 ± 1.9 g/dL. **Conclusion**: This study identified factors as-

sociated with the development of acquired cystic kidney disease in hemodialysis patients in our setting. Regular screening is necessary for patients on hemodialysis for more than 3 years to prevent certain complications, particularly renal cell carcinoma.

Keywords

Acquired Cystic Kidney Disease, Chronic Hemodialysis, Renal Ultrasound, Renal Cell Carcinoma

1. Introduction

Acquired cystic kidney disease (ACKD) is defined as the presence of four or more cysts in each kidney in a patient with no history of hereditary or congenital cystic kidney disease who has end-stage renal disease [1]. Its prevalence in hemodialysis patients is highly variable, ranging from 10% to 31% depending on the study [2].

These cysts can remain asymptomatic for a long time. Truong *et al.*, in a literature review, reported that 86% of patients with acquired cystic kidney disease presented no symptoms [3]. The diagnosis is made by the presence of three or more cysts, most often detected by medical imaging, particularly ultrasound or computed tomography (CT), with the latter having higher sensitivity [4]. The most serious complication of acquired cystic kidney disease is the development of renal cell carcinoma. In ACKD, multifocal hyperplasia can lead to the formation of an adenoma or adenocarcinoma. Some believe that parathyroid hormone stimulates neoplasia in association with secondary hyperparathyroidism by activating adenylate cyclase and thereby promoting the activation or sustained mutation of one or more proto-oncogenes [5].

In sub-Saharan Africa, data are virtually non-existent. Therefore, to better understand this pathology in our context, we conducted this study with the objectives of determining its prevalence, defining its clinical profiles and ultrasound characteristics, and identifying the factors associated with its development.

2. Patients and Methods

This was a descriptive and analytical multicenter cross-sectional study conducted over 7 months (November 1, 2024, to May 31, 2025) in the Hemodialysis Centers of three hospitals in Dakar. We included chronic hemodialysis patients, aged 18 years or older, whose dialysis duration exceeded three years, and in whom renal ultrasound revealed at least four cysts in each kidney. Patients receiving fewer than two weekly dialysis sessions, patients with autosomal dominant polycystic kidney disease, and patients with pre-existing renal cysts before starting hemodialysis were excluded.

Screening for acquired cystic kidney disease was performed by an ultrasound technician using a GE Logis P7 ultrasound scanner. The renal ultrasound report

was completed on a pre-established form for each patient.

For each patient, we collected epidemiological data (age, sex, occupation), clinical and biological data, and dialysis parameters (duration and frequency of sessions, type of vascular access, and dialysis dose (kt/v)) from hemodialysis logs and medical records.

ACKD was defined as the presence of an average of three cysts in each kidney in a hemodialysis patient with no history of hereditary renal cysts.

The collected data were entered into Excel and then analyzed using SPSS (Statistical Package for the Social Sciences). Variables were compared using the chi-square test or Fisher's exact test, depending on their applicability. Results were considered statistically significant when the p-value was less than 0.05. The local ethics committee approved the study.

3. Results

The study population consisted of 135 chronic hemodialysis patients, among whom 41 patients had ACKD, representing a prevalence of 30.37%. The mean age of the patients was 51.49 ± 13.4 years, with a male-to-female ratio of 2.15. The over-50 age group was the most represented at 51.22%, followed by patients between 30 and 50 years of age; only one patient was under 30. Patients with a dialysis duration greater than 61 months represented 78.04%, and those with a dialysis duration less than 60 months represented 21.95% (**Table 1**).

Hypertensive nephropathy accounted for 39.03% of the underlying nephropathies, followed by chronic glomerulonephritis at 26.83% (**Figure 1**).

Regarding dialysis parameters, in our study, all patients underwent three sessions per week. Arteriovenous fistulas were the vascular access used in 85.37% of cases, and tunneled catheters in 14.63%. The dialysis membrane used for all patients was polysulfone. The mean KT/V was 1.46 ± 0.18.

Lower back pain was present in 29 patients (70.73%). The other patients were asymptomatic. No patient experienced episodes of macroscopic hematuria.

Biologically, the mean hemoglobin level was 10 ± 1.90 g/dL, with a mean ferritin level of 738.76 ± 622.31 µg/L and a ferritin saturation of 27.06% ± 11.20%. The mean serum calcium level was 87.45 ± 10.01 mg/L, with a mean serum phosphate level of 33.29 ± 12.52 mg/L and a mean value of Intact Parathyroid Hormone (Intact PTH) of 879 ± 876.22 pg/mL.

Ultrasound findings revealed that the mean length of the right kidney was 97.14

Table 1. Distribution of patients according to the duration of dialysis.

Duration of dialysis in months	Number	Percentage
37 - 60	9	21.95
61 - 120	16	39.02
>120	16	39.02
Total	41	100 %

± 20.74 mm, the mean width was 49.40 ± 13.88 mm, and the mean thickness was 33.36 ± 6.43 mm. The left kidney measured on average 93.42 ± 22.54 mm in length, 50.04 ± 14.16 mm in width, and 33.681 mm in thickness.

Nineteen patients (46.34%) had corticomedullary cysts (Figure 2), thirteen patients (31.71%) had medullary cysts, and nine patients (21.95%) had cortical cysts (Table 2).

The right kidney had a mean number of cysts of 6.93 ± 3.72, with a range of 3

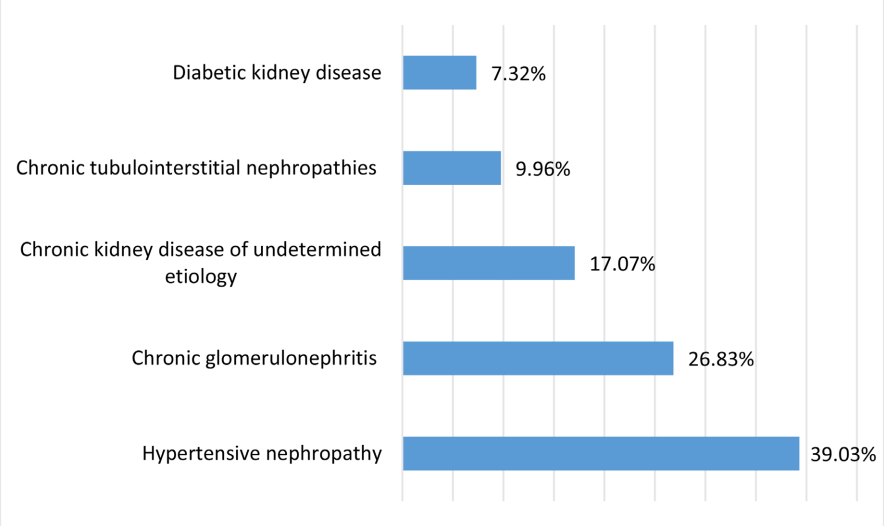

Figure 1. Distribution of patients according to the underlying nephropathy.

Figure 2. Cortico-medullary ACKD in one of our patients who has been on chronic hemodialysis for 60 months.

Table 2. Distribution of patients according to ultrasound characteristics.

Cysts	Number	Percentage
Location of cysts		
Cortico-medullary	19	46.34
Medullary	13	31.71
Cortical	9	21.95
Cyst outline		
Regular	40	97.56
Irregular	1	2.44
Intracystic changes	0	0

to 16 cysts. The left kidney had a mean number of cysts of 6.27 ± 3.03, with a range of 3 to 13 cysts. The mean cyst size was 22 ± 8.06 mm in length, with a range of 1.9 to 45.7 mm. The ultrasound characteristics of the cysts are summarized in **Table 2**.

Univariate analysis after comparing two groups, with and without acquired renal cysts, showed that the following parameters were associated with the occurrence of acquired renal cysts in our patients: male sex ($p < 0.001$), duration of dialysis (over 60 months) ($p = 0.008$), low diastolic blood pressure ($p = 0.002$), low Kt/V ($p = 0.002$), and a hemoglobin level greater than 10 ± 1.9 g/dL.

4. Discussion

The prevalence of ACKD in our cohort was 30.37%. A similar prevalence was found in African studies [6] [7]. However, Asian studies found lower prevalences than ours [8] [9]. These differences in prevalence can be explained by the diagnostic criteria used and the duration of dialysis, since our study included all patients with at least three cysts in each kidney and whose dialysis duration exceeded 36 months.

The average age of our patients was relatively young compared to other series [9] [10]. This can be explained by the young age of the dialysis population in Senegal [11], but also by the insufficient number of nephrologists for better monitoring before the dialysis stage and the limited access to kidney transplantation.

We observed a male predominance and a statistically significant correlation with the occurrence of ACKD. In the literature, these results are consistent and suggest that the male hormone plays a role in the initiation and epithelial hyperplasia that precedes the development of acquired cysts [12] [13].

In our study, a low dialysis dose was associated with the occurrence of ACKD. This finding has been reported in several studies [8] [9].

There was a statistically significant correlation between hemoglobin levels and ACKD. This is similar to the results of some authors who hypothesize that ischemia and hypoxia of the renal interstitium lead to increased erythropoietin pro-

duction [12] [14].

Cortico-medullary cysts were the most common, representing 46.34% (n = 19). The mean number of cysts in the right kidney was 6.93 ± 3.72 mm, and in the left, 6.27 ± 3.03 mm. In the literature, cysts can be located anywhere in the kidney without a predilection site. The diameter of the cysts usually ranges from 3 mm to 5 cm [15].

The most serious complication of renal cell carcinoma (RCC) is its transformation into renal cell carcinoma due to multifocal hyperplasia. Some believe that parathyroid hormone stimulates neoplasia in association with secondary hyperparathyroidism by activating adenylate cyclasses, thereby promoting the activation or sustained mutation of one or more proto-oncogenes [5].

This complication was not observed in our cohort. This renal carcinoma associated with ACKD is most often asymptomatic, so that at diagnosis, 30% of patients are at the metastasis stage [16], hence the need for rigorous monitoring of these patients.

5. Conclusion

ACKD is common in our hemodialysis patients. Factors associated with its occurrence have been identified. Screening for RCC should be systematic in all patients who have been on dialysis for more than three years. Annual monitoring is required for patients with ACKD to detect early transformation into renal cell carcinoma.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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