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Prognosis of Chronic End-Stage Renal Failure in Patients under 20 Years of Age in Conakry

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Abstract

Introduction: End-stage renal disease (ESRD), requiring purification during Child Hood, is a rare situation and a source of high morbidity and mortality, raising ethical questions. In Guinea, the lack of national registers of pediatric chronic kidney disease, the absence of a nephropediatric service, the treatment of certain pediatric cases of CKD in the adult hemodialysis center, and the consequence on the evolution of children undergoing replacement therapy is not evaluated in terms of survival. We are conducting this study to assess the prognosis of CKD and chronic hemodialysis in patients under 20 years of age. The survival of patients under 20 years of age on chronic hemodialysis in an adult hemodialysis center is considerable. **Material and Methods:** This is a retrospective study of chronic end-stage renal disease in patients under 20 years of age, who may or may not have received chronic hemodialysis in an adult hemodialysis center. In our study, we included the records of patients under 20 years of age, with a creatinine clearance of less than 15 mL/min/1.73m^2 according to the Schwartz formula, who did or did not accept chronic hemodialysis. **Results:** out of 724 patients hospitalized with all pathologies during the study period, we obtained 55 patients under 20 years of age with chronic end-stage renal disease, i.e., a frequency of 8 %, representing our study population. The mean age was 13 ± 3 years, with extremes ranging from 9 to 19 years. We found a predominance in the 15 - 19 age group, numbering 49 patients, or 89.09%. Of 55 patients under 20 years of age with chronic end-stage renal failure, 34 patients who had received chronic hemodialysis, only 24 patients (70.59%) were still alive, while 10 patients (29.41%) had died. **Conclusion:** The aim of this retrospective study on the prognosis of chronic end-stage renal failure in patients under 20 years of age, enabled us to obtain a hospital frequency equal to 8%. The main cause of chronic renal disease was glomerular nephropathy. The death rate was essentially due to the lack of nephropediatric services, and the lack of equipment for suppletive treatment adapted to children.

Keywords

End Stage Renal Disease, Prognosis, Children

1. Introduction

Chronic renal failure (CRF) is defined as a progressive and irreversible deterioration in the renal, resulting in a drop in glomerular filtration rate. It can occur in children, even the very young. CKD is an uncommon problem in paediatric, but its diagnosis is important in view of the major advances made in the treatment of this condition through dialysis and, above all, renal transplantation [1].

End-stage renal disease (ESRD), requiring purification during Child Hood, is a rare condition and a source of high morbidity and mortality, raising ethical questions. Although advances in chronic dialysis in children have led to improved outcomes in terms of growth, development and quality of life, data in children are poor, particularly on long-term prognosis [2].

The development of dialysis and kidney transplantation programs in Western countries has led to studies evaluating the frequency of end-stage renal disease in children [1]. Statistics from France and the USA all agree that the annual incidence of end-stage renal disease (ESRD) is estimated at 6 to 10 cases per million children, with a peak in children over 9 years of age [1].

In France, the 2018 incidence of treated end-stage renal disease by age (per million population) in the age range between (00 - 19 years) out of n = 127, the percentage was 1.1%, and the standardized rate per million population was 8%. The overall prevalence of end-stage renal disease treated by dialysis or transplantation on 31/12/2018, by age, for all 27 regions (per million inhabitants), by age bracket from (00 - 19 years) n = 933 or 1.0%, the standardized rate per million population was 56% [3].

Data on pediatric CKD are scarce. In the Olowu study in Nigeria, hospital incidence was estimated at 1.83%. In developing countries, paediatric nephrologists are faced with the daily challenge of managing this disease, which requires adequate information for the population and policies for screening and prevention [4].

In Guinea, the lack of national registers of pediatric chronic kidney disease, the absence of a nephropediatric service, the treatment of some pediatric cases of CKD in the adult hemodialysis center, and the consequence on the evolution of children in suppletive treatment is not evaluated in terms of survival. We are conducting this study to assess the prognosis of CKD and chronic hemodialysis in patients under 20 years of age. The survival of patients under 20 years of age on chronic hemodialysis in an adult hemodialysis center is considerable.

2. Materials and Methods

This is a retrospective study of chronic end-stage renal failure in patients under 20 years of age, who may or may not have received chronic hemodialysis in an

adult hemodialysis center. In Guinea, we have a single public hemodialysis center located in the capital, Conakry, precisely in the CHU de Donka. The study was carried out in the nephrology department and the Donka national hemodialysis center. The national hemodialysis center (including two 15-station hemodialysis rooms and an inpatient unit) is located at the Donka National Hospital. It is a national referral service for adult and nephron-pediatric renal diseases due to the lack of a nephron-pediatric service.

Data were collected from hospitalization records, hospitalization registers, hemodialysis notebooks and hemodialysis follow-up records. This was a retrospective descriptive study, covering the period from September 1, 2021 to August 31, 2023, i.e., a duration of 2 years. We targeted all patients hospitalized in the nephrology department for chronic end-stage renal disease during the study period.

The study population consisted of records of patients under 20 years of age with chronic end-stage renal disease, hospitalized in nephrology-hemodialysis during the study period.

In our study, we included the records of patients under 20 years of age, with a creatinine clearance of less than 15 mL/min/1.73m^2 according to the Schwartz formula, who had accepted or not accepted chronic hemodialysis. Incomplete and unusable files have not been included in this work for patients with stage 1, 2, 3, and 4 chronic kidney disease. Late discovery of end-stage renal disease precluded renal biopsy to obtain histological data.

All inpatient records from the nephrology department and the national hemodialysis center from 2021 to 2023 were manually searched to obtain a study sample size of 55 patients. Data were collected on an individual survey form (**Appendix**), according to the selection criteria: frequency, age, sex, initial chronic kidney disease, hemodialysis treatment, conservative treatment, and prognosis. Each variable was defined to describe the measurement modalities.

- Frequency: proportion of CKD in patients under 20 years of age out of the total number of CKD cases

- Age: age groups were defined in 5-year increments

- Sex: to define the sex ratio.

- Types of chronic kidney disease: different types of kidney disease were considered on the basis of clinical and paraclinical data :

- Glomerular nephropathy: was considered when glomerular proteinuria was greater than 1.5 g/L, with or without microscopic haematuria, often associated with hypertension.

- Vascular nephropathy: a history of hypertension of more than 5 years, kirkendal stage 1-3 hypertensive retinopathy, cardiomegaly on X-ray or LVH on ECG and proteinuria less than or equal to 1 g/L.

- Tubulointerstitial nephropathy: this was suggested by the association of a history of chronic pyelonephritis, malformative uropathy, humped kidneys, tubular proteinuria (less than or equal to 0.5 g/L), isolated leukocyturia, without edema, and without hypertension;

- Indeterminate nephropathy: this corresponded to cases not classified because

of an incomplete paraclinical work-up.

- Treatment: hemodialysis and conservative treatment:

- Hemodialysis: purification by extracorporeal circuit;

- Conservative treatment: symptomatic treatment with drugs (Antihypertensives, Calcium + vitamin D3, Erythropoietin, Sodium bicarbonate, Kayexalate) at the stage of chronic end-stage renal failure.

- Prognosis: measured by survival and death rates according to treatment.

Data entry and analysis were carried out using software (Word, Excel) and Epi info version (7.1.0) 2014. Our results were presented in text and table format, commented on, discussed and compared with current data in the literature.

3. Result

Out of 724 patients hospitalized with all pathologies during the study period, we obtained 55 patients who were under 20 years of age and had end-stage chronic renal failure, which is a frequency of 8%, which represents our study population.

Gender: out of 55 patients, 28 cases or 50.90% were male, which predominated in our study, and 27 patients or 49.1%, were female. Sex-ratio = 1.04.

Our patients were divided into age brackets with a 5-year amplitude. The 55 patients were divided into age brackets. The average age was 13 ± 3 years, with extremes ranging from 9 to 19 years. We found a predominance in the 15 - 19 age bracket, numbering 49 patients, i.e., 89.09%.

Of the 55 patients under 20 years of age with chronic end-stage renal disease, the type of initial nephropathy was dominated by 42 cases of glomerular nephropathy, which is 76.36%.

Among the 55 end-stage renal failure patients under 20 years of age, 34 (61.82%) had undergone chronic hemodialysis, while 21 (38.18%) remained on conservative treatment.

Out of 55 patients under 20 years of age with chronic end-stage renal failure, 34 patients who had received chronic hemodialysis, only 24 patients (70.59%) survived, while 10 patients (29.41%) died.

4. Discussion

The aim of this study was to assess the prognosis of end-stage renal disease in patients under 20 years of age. To answer this question, it is important to find out the frequency of end-stage renal disease in this population. In our study, we enrolled 55 patients under 20 years of age with end-stage renal disease according to our selection criteria, representing a frequency of 8% (**Figure 1**).

The mean age of our patients was 13± 3 years, with extremes ranging from 9 to 19 years, and we found a predominance in the 15-year age group, with 49 patients or 89.09%.

Of 55 patients, 28 (50.90%) were male and 27 (49.1%) female, with a sex ratio of 1.04. The predominance was male (**Table 1**).

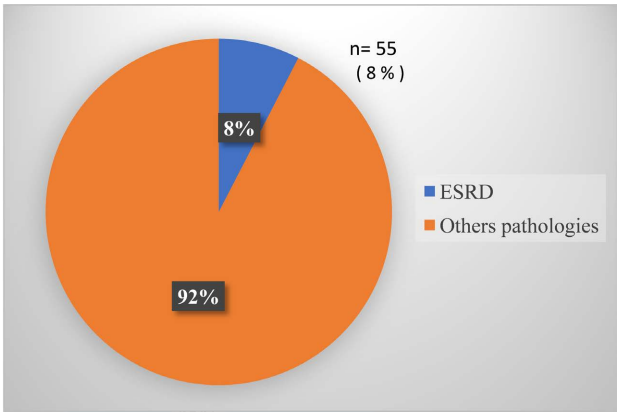

Figure 1. Distribution of end-stage renal failure patients in nephrology according to total number of hospital admissions from September 1, 2021 to August 31, 2023.

Table 1. Distribution of end-stage renal failure patients under 20 by age group.

Age groups (years)	Workforce	Percentages
Less than 10 years	1	1.82
10 - 14	5	9.09
15 - 19	49	89.09
Total	55	100

These hospital proportions are not negligible; they are impulsive in our geographical setting, in order to set up a Nephropediatrics department to boost care, enabling us to improve the prognosis of chronic end-stage renal failure in patients under 20 years of age.

In 2006, Lagou *et al.*, in the nephrology department of the CHU de Yopougon in Côte d'Ivoire, reported on 24 cases of chronic renal failure in children over a 6-year period in a retrospective study. Of these patients, 21 (87.5%) were in end-stage CKD [1].

Younoussa Kéita *et al.* in 2024 in Sénégal, found 53 cases of chronic renal failure, of which 18 patients (34%) had end-stage chronic renal failure. The average age was 10.6 years, with the 10 - 15 age group accounting for 64.15% of cases [4].

Manel Jellouli *et al.* in 2016 in Tunisia, in a retrospective study in the pediatrics department of Hedi Chaker Hospital in Sfax, over a 15 years period included a total of 166 children with chronic end-stage renal disease, respectively 24 children (14.5%) aged under 2 years, 24 children (14.5%) aged 2 to 6 years, and 118 children aged over 6 years. The sex ratio was 1.4 [5].

Maiga Zeinabou *et al.* in 2018 in Niamey found out of a total of 100 children who were Registered for renal failure. In the 10% (N = 10) with chronic renal failure (CRF), the mean age was 11 ± 2.3 years. It was more frequent in the [10 - 15 years] age group at 70% [6].

Hospital frequencies of end-stage renal disease in patients under 20 years of age vary from one hospital to another, but the existence of nephropediatrics

departments has made it possible to record an increasingly high frequency of end-stage renal disease in children.

Clinically, in 55 patients under 20 years of age with chronic end-stage renal disease, the initial nephropathy was dominated by 42 cases of glomerular nephropathy (76.36%) (Table 2).

Table 2. Distribution of patients under 20 years of age in end-stage chronic renal failure, by type of initial kidney disease.

Age groups (years)	Workforce	Percentages
Glomerular nephropathy	42	76.36
HIVAN	2	3.64
Vascular nephropathy	8	14.54
Nephropathy undetermined	1	1.82
NTIC	2	3.64
Total	55	100

In 2006, Lagou *et al*., identified the etiology of chronic renal failure in 20 cases (80.33%). Glomerular nephropathy was the main etiology of chronic renal failure in children in their study, with a frequency of 75% [1].

Younoussa Kéita *et al.* in 2024 in their study the most common causative lesion was chronic glomerulopathy, accounting for 52% [4].

Driollet Bénédicte in her thesis in 2020, Congenital anomalies of the kidney and urinary tract are frequently encountered, and in the case of pediatric CKD, they account for 50 to 60% of etiologies, particularly in babies and very young children. Glomerular nephropathies account for 5 to 15% of pediatric CKD, mainly affecting children over 12 and adolescents [7].

The causes of chronic renal failure in patients under 20 years of age are dominated by glomerular nephropathy, with similar findings in the scientific literature from developing countries (Table 3).

Table 3. Distribution of end-stage renal failure patients under 20 years of age, by therapeutic modality.

Therapeutic modalities	Workforce	Percentages
Conservative treatment	21	38.18
Hemodialysis	34	61.82
Total	55	100

In our study, we found 33 cases of survival and 22 cases of death in children under 20 with chronic end-stage renal disease (Table 4). The high death rate is linked to a lack of nephropediatric services and equipment adapted to children's

dialysis, and the choice of conservative treatment in relation to low socio-economic status.

Table 4. Distribution of end-stage renal failure patients under 20 years of age by prognosis.

Pronostic / Treatment	Survie	Deaths	Workforce	Percentages	P-value
Curator	9 (42.86)	12 (57.14)	21	38.18	0.003
Hemodialysis	24 (70.59)	10 (29.41)	34	61.82	0.008
Total	33	22	55	100	-

LAGOU *et al.* in 2006 reported that all 5 patients put on dialysis died within an average of 8.8 months (2 - 24 months), giving a zero survival rate at 2 years. In Europe, dialysis mortality in children is low. The survival rate is 95% at 2 years. The main cause of death in our study was heart failure. This was due to the decompensation of cardiomyopathy linked to hypertension and aggravated by anemia [1].

Younoussa Kéita *et al.* in 2024, The low survival rate in our work could be explained on the one hand by the insufficient dialysis dose (2 sessions per week for most children) and the unsuitable equipment used, and on the other hand by the limited access to erythropoiesis stimulating agents, growth hormone, nutritional and psychosocial support [4].

In our study, the death rate is explained by a lack of nephropediatric services and equipment adapted to children's dialysis. Our results are internally valid, based on the practical modalities of the variables measured and on the comparison of the results obtained with data from the scientific literature. However, the presence of a bias related to the hospital setting, the lack of a national register of paediatric kidney disease, the absence of histological data, and the therapeutic modalities adapted to childhood, influence the external validity of the results of our study, but the results are exploitable in our local context.

With a view to reducing mortality in the field of nephropediatrics, this study could provide support to the political authorities with a view to setting up a nephropediatrics department equipped for the medical management and replacement treatment of children with end-stage chronic kidney disease.

Ethical considerations: we respected anonymity in this study, as well as data confidentiality, and the authorization of the staff in charge of the nephrology and hemodialysis departments.

Study limitations: the study's limitation is that, as it is a hospital study, the data could not be extended to the entire population.

5. Conclusion

The aim of this retrospective study on the prognosis of chronic end-stage renal

failure in patients under 20 years of age enabled us to obtain a hospital frequency equal to 8%. The main cause responsible for chronic renal disease was glomerular nephropathy. Most of the results in the scientific literature were similar to our own. The death rate was essentially linked to the lack of nephropediatric services, and the lack of equipment for suppletive treatment adapted to children. Financial support from the political authorities would fill this gap in the management of chronic kidney disease.

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Conflicts of Interest

This manuscript is not the subject of any conflict between the authors and is not submitted to any other journal.

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Appendix

SURVEY N°.....

End-stage renal disease in patients under 20 years of age

Identity:

- **Surname**: -First name:

-Sexe: -Age: -Schooling:

Socio-economic status: low no □yes □ medium no □yes □ high no □ yes □

History:

Personal: urinary tract infection: yes□ no □ edema yes □ no □

HTA yes □ no □ Diabetes and type yes □no □

-Other:

Family: CKD yes □ no □ Known kidney disease

Genetic disease yes □ no □ Lithiasis yes □ no □

Diabetes yes □ no □ HTA yes □ no □

Reasons for hospitalization:

Functional signs: Anorexia yes □ no □ - MS Delay yes □ no □

-Anemia yes □ no □ -Vomiting yes□ no□ -Bone pain yes □ no □

-Limb deformity yes □ no □ -Loss of weight yes □ no □

-Dyspnea yes □ no □ -dysuria yes □ no □ -Hematuria yes □ no □

-polyuria yes □ no □ -pollakiuria yes □ no □ -oliguria yes □ no □

-Anuria yes □ no□ -Polydipsia yes □no □ -Headache yes□ no□

-Convulsion yes □ no □

-Other:

CLINICAL EXAMINATION: -Weight: height: -PA

-Edema yes □ no □ -FC: FR: T°: SG

-Urine dipstick: Pu hu leuco glucose -Diuresis:

-OGE examination:

-Mucocutaneous examination:

-Pleuropulmonaire examination:

-Abdominal examination:

-Neurologiques examination:

-Cardiovascular examination:

-Lymph nodes:

-The rest of the somatic examination:

-Other:

Biological: -Clairance of creatinine:

-Urea: Creatinine: -ECBU;

-Natremia: Kalemia: -Calcemia: RA:

-Phosphatemia: Uric acid: -Protidemia: -CRP:

-CBC: Hb VGM: CCMH: PLAQ: WBC:

-Serum iron: Ferritinemia: -PTH:

-Viral serologies:

Renal ultrasound: -mensuration:

-pyelocaval dilatation:

-bladder status:

Chest X-ray: report

Etiological diagnosis: no □ yes □

Histological report:

Complications: OAP no □ yes □, Metabolic acidosis no □ yes □, hyperkalemia no □oui □, uremic intoxication no □ oui □

Conservative treatment: drugs

Sodium bicarbonate powder: no □ yes □

Kayexalate: no □ yes □

Antihypertensives:

Calcemia supplementation:

Transfusion of packed red blood cells:

Diuretics:

Antibiotic therapy:

Other:

Hemodialysis: Femoral catheter no □ yes □ -Jugular catheter no □ oui □

Vaccination: HVB no □ yes □

Prognosis: Survival no □ yes □ Died yes □ no □