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Childhood Chronic Kidney Disease: Experience of a Pediatric Department

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Abstract

Introduction: Chronic renal failure (CRF) for children is a major problem of public health both in poor and developed countries. This study aimed to investigate the diagnosis and the management options of CRF for children.

Patients and methods: This study retrospectively evaluated patients who had Chronic Kidney Disease in the department of pediatric emergency and reanimation in Hedi Chaker hospital in Sfax between 2005 and 2016.

Results: Over 11 year's period, we diagnosed and managed 41 children with CRF. The estimated incidence of CRF is 4.7 new cases per million-child population per year. Parental consanguinity was found in 16 patients (39%). Family history with kidney disease was noted in 6 cases (14.6%). Malformations of the urinary tract were observed in 24 patients (58.5%). Other causes are divided into hereditary kidney disease in 8 patients (19.5%) predominated by primary hyperoxaluria, in vascular nephropathy who were objectified in 5 patients (12%) whereas glomerulopathy were represented in 3 cases (7.5%). No etiology was found in 1 patient. Over the 11 years 22 patients (54%) had renal replacement therapy (RRT). Peritoneal dialysis (PD) was practiced in over then 90% of patients. A passage from peritoneal dialysis to hemodialysis was done in 8 patients. Only four patients had a kidney transplant. The rate of overall mortality in our series was 40% with median of follow-up in 54 months.

Conclusion: In Tunisia and in all Low source country children with CRF must be treated by pediatric nephrologists and the pediatric renal transplantation must be developed.

Keywords: Chronic; Renal failure; Children

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Introduction

Chronic renal failure (CRF) for children is a major problem of public health both in poor and developed countries [1]. The causes of the child's CRF are mainly the defects of the kidney and urinary tract, hereditary diseases and glomerulopathy [2]. Over 50% of the kidney diseases causing the CRF for the child are hereditary or congenital. Furthermore, diabetes and high blood pressure are about half of cases for the adult [3]. This study aimed to investigate the diagnosis and the management options of CRF for children.

Patients and Methods

This study retrospectively evaluated patients who had Chronic Kidney Disease (CKD) in the department of pediatric emergency and reanimation in Hedi Chaker hospital in Sfax between 2005 and 2016. Different information concerning sex, age, the circumstances of discovery, the personal history, diagnosis of CRF, treatments and evolution of CRF were collected and analyzed.

The clearance of serum creatinine relative to the body surface area was calculated by the Schwartz formula: K* Size (cm)/plasma creatinine (mg/dL). The constant K was equal to 36.5 irrespective of sex and age of the child outside of prematurity. Blood creatinine was measured by the enzymatic method. In general, CRF is light for a GFR between 60 and 89 mL/min/1.73 m^2, moderate between 30 and 59 mL/min/1.73 m^2, severe between

15 and 29 mL/min /1.73 m^2 and terminal for a GFR of less than 15 mL/min/1.73 m^2.

Results

Over 11 year's period, we diagnosed and managed 41 children with CRF. 25 were male (61%) and 16 were female (39%). the average age was 4.9 years (1.5 months-13.5 years). CRF represented 6.8% pathologies of children hospitalized in our department during this period. The estimated incidence of CRF is 4.7 new cases per million-child population per year. The history of urinary tract infection was found in 13 patients (32%). Parental consanguinity was found in 16 patients (39%). Family history with kidney disease was noted in 6 cases (14.6%). Renal failure was discovered on the occasion of clinical symptoms in 29 patients (71%). Hypertension was observed in 20 patients (49%), digestive disorders were found in 19 patients (46%), anorexia in all children and vomiting in 13 patients (32%) while osteodystrophy clinical signs were observed in 15 patients (36.6%). In biology exploration, anemia was found in 34 patients (83%), hypocalcemia was seen in 20 children (49%), hyperphosphataemia is seen in 20 children (49%), the average value of the urea at diagnosis is equal to 27 mmol/l +/- 15 mmol/l, with a range of 7-63 mmol/l. Thirteen patients (32%) had uremia>30 mmol/l at diagnosis. Creatinine at diagnosis ranged from 79 mg/dL to 1000 mg/dL with a median equal to 232 mg/dL. The creatinine clearance calculated using the Schwartz formula was between 3 and 49.6 ml/min/1.73 m^2 with a mean of 18.6 ± 13 ml/min/1.73 m^2. Renal ultrasonography was performed in all patients. Malformations of the urinary tract were observed in 24 patients (58.5%). The most frequent malformations were represented by a neurological bladder in 8 cases, hypoplasia/renal dysplasia in 5 cases. Vesicoureteral Reflux and congenital posterior urethral valves were found in 7 cases, a megaureter in 2 cases and a pyelo-ureteral junction syndrome in 2 cases. The ureteral reimplanation was made for patient who had Vesicoureteral Reflux and megaureter. The congenital posterior urethral valves had a resection in the 1st year of life. Medical treatment was prescribed in all patients with neurological bladder, of which 3 were operated on later and had a vesical enlargement. Other causes are divided into hereditary kidney disease in 8 patients (19.5%) predominated by primary hyperoxaluria, in vascular nephropathy who were objectified in 5 patients (12%) whereas glomerulopathy were represented in 3 cases (7.5%). No etiology was found in 1 patient (**Table 1**). Over the 11 years, 34 children were terminally CRF (83%). 22 patients (54%) had renal replacement therapy (RRT). 5 patients (12%) were died before starting dialysis. Peritoneal dialysis (PD) was the most used technique. It was practiced in over then 90% of patients. It was the dialysis method of choice for patients under the age of 2 years. Hemodialysis was initially performed in only two patients. A passage from peritoneal dialysis to hemodialysis was done in 8 patients. Only four patients had a kidney transplant; they were 2 girls and 2 boys aged between 11 and 16 years. The rate of overall mortality in our series was 40% with median of follow-up in 54 months.

Table 1 Etiology of CRF children.

Primary renal disease	n (%)
Congenital urological malformation:	24 (58.5%)
-neurogenic bladder	8
- hypoplasia / renal dysplasia	5
- Vesicoureteral Reflux	3
- congenital posterior urethral valves	4
- Megaureter	2
-pyelo-ureteral junction syndrome	3
hereditary kidney disease	8 (19.5%)
vascular nephropathy	5 (12%)
Glomerulopathy	3 (7.5%)
No etiology	1 (2.5%)

Discussion

Chronic renal failure (CRF) is an important cause of morbidity and mortality in children worldwide. The disease process is better termed as chronic kidney disease (CKD), in order to encompass the entire spectrum and severity of renal disease [4]. The incidence of CRF varies in different parts of the world. In most developed countries the incidence varies between 4-10 per million-children below 18 years of age [5]. The etiology of CRF varies in different parts of the world. Hereditary disorders are more common in regions, where the frequency of consanguineous marriages is high [6]. In our study parental consanguinity was found in 39% of patients and family history with kidney disease was noted in 14.6% of cases. The detecting of CKD is important for pediatricians, family physicians, pediatric nephrologists, urologists and other health care providers who have the opportunity to detect CKD in children and adolescents during its early stages [7]. In our work the majority of patients with CRF were detected on the occasion of clinical symptoms. The CRF was discovered at a very advanced stage, these results can be explained by the CRF is made that a condition that remains long few symptoms but also by inadequate management and sometimes late renal pathologies likely to progress to the CRF. These results are close to those of the Indian series and the Egyptian series who report frequent ESRD at diagnosis respectively about 54% and 57.6% [8,9].

But these values are considerably high compared to European data records [10,11]. All attempts should be made to determine the aggravating factors for worsening renal functions in any given child [7]. Anemia, renal osteodystrophy and acidosis are often the presenting features and have a variety of deleterious consequences [4]. In our patients anemia was present in 83% of patients and osteodystrophy was noted in almost the half of patients. An understanding of the important causes of CRF in any country is important as it may guide the distribution of limited resources towards its prevention [4]. According to the data of our series, uropathies malformations represented the most common of the child's CRF (58.5%). Hereditary kidney diseases were the second etiology of childhood CKD (19.5%) represented mainly by primary hyperoxaluria followed by vascular nephropathy (12%). Glomerular renal disease accounted for only 7.5% of the causes of the CRF when they were about 23% of the causes of CKD in the series. Our results are close to those of European studies where uropathies malformations are the leading cause of chronic renal failure in children (more than 55% of etiologies) followed hereditary kidney disease (between 15% and 19%) and glomerular renal disease (between 5% and 11.5%) [12-14]. In America, the distribution of etiologies reported by various US

registers is a little different [15]. Indeed, urinary malformations remain the leading cause of CKD in children (48%), however, the second cause is represented by glomerulonephritis (14%) followed by hereditary kidney disease (10%). This distribution is also found in neighboring Mediterranean countries such as Egypt [16] and Algeria [17]. Significant advances have been made in the understanding of various renal replacement measures, which have enabled provision of better care. Both chronic peritoneal dialysis and hemodialysis along with other supportive measures can ensure longevity and improved quality of life in patients with CRF [4]. Management of children with CKD aims at possible interventions to retard progression of disease and the treatment of co-morbid conditions in the early stages [4]. In our study, majority of our patients required extra renal purification. 90% of dialysis children were initially purified by the peritoneal dialysis. Only 4 patients received a kidney transplant [18,19].

Conclusion

Studies in developed countries have shown that children with CKD cared for by pediatric nephrologists fare better in the long run than those managed at adult nephrology units. So in Tunisia and in all Low source country children must be treated by pediatric nephrologists and the pediatric renal transplantation must be developed.

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