Chronic Renal Failure in Jamaican Children

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ABSTRACT

In order to document the incidence, aetiology and outcome of chronic renal failure in Jamaican children, paediatric surgeons and hospital based paediatricians island-wide were contacted, and the nephrology records at the island's paediatric nephrology centres searched for data on children < 12-years-old with chronic renal failure diagnosed for the first time between January 1985 and December 2000. Thirty-four children were identified, 21 were male. The cumulative annual incidence of chronic renal failure was 3.2 per million children aged < 12 years. The incidence is likely underestimated, as some children may have been undiagnosed and/or not referred. Glomerulonephritis was the commonest cause of chronic renal failure (50%) followed by obstructive uropathy, reflux nephropathy, renal dysplasia and chronic pyelonephritis (41.2%). Five children (14.7%) had reflux nephropathy (post obstructive in four). Half the children were already in chronic renal failure at time of presentation. Mortality was 65%. In Jamaica, childhood chronic renal failure is due mainly to potentially treatable diseases. Local physicians should be more aware of potentially progressive renal diseases and their prevention. Earlier referral of difficult cases for nephrological consultation is recommended. A paediatric dialysis/ transplant programme is needed.

INTRODUCTION

In the year 2000, Jamaica had an estimated population of 2.6 million of which approximately 33% were children under the age of 12 years (1). The country is divided into 14 parishes. The capital city is Kingston. The adjacent parishes of Kingston and St Andrew (KSA) constitute the commercial centre of the island, and house the tertiary centres of Paediatric care - the University Hospital of the West Indies (UHWI) and the island's only Paediatric hospital - the Bustamante Hospital for Children (BCH). Paediatric surgery is only available at BCH and UHWI. Seven of the island's parishes have hospitals served by paediatricians and it is to these that children with more serious illnesses would be referred initially. The island's first paediatric nephrology service was established in December 1984 at the UHWI. All cases of chronic renal failure (CRF) would be expected to have been referred there from the other hospitals in the country. Since January 1999, paediatric nephrology has also been offered at BCH. Jamaica has had dialysis/transplantation facilities for adults (by definition age > 12 years) since 1970, but to date, there is no such programme for

children. From December 1984 to the present time, it has been observed that in the majority of children, CRF has resulted from preventable underlying diseases. However, no studies had been undertaken to substantiate this impression, or to assess the extent of the problem islandwide. The aim of this study was to document the incidence, aetiology, and outcome of chronic renal failure in Jamaican children < 12 years of age, diagnosed between January 1985 and December 2000.

SUBJECTS AND METHODS

The island's two paediatric surgeons as well as paediatricians serving in public hospitals island-wide outside of KSA were contacted by telephone and written questionnaire requesting information on any new cases of chronic renal failure under the age of 12 years, seen at their hospital between January 1985 and December 2000. The data on children from KSA were obtained from the renal records of children presenting to UHWI and BCH for the first time with CRF during this period.

Chronic renal failure was defined as a serum creatinine of > 133μmol/l in children under the age of two years and > 175μmol/l in children over the age of two years present for at least three months (2), or for less than three months if there was clinical evidence of chronic renal failure, namely renal osteodystrophy, anaemia and/or ultrasonographic evidence of shrunken kidneys. This category was included as some CRF patients presented for

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the first time in terminal renal failure and died within three months of diagnosis. The cut off period of three months was used to distinguish between children with acute and chronic renal failure. The criteria, however, excluded those children and neonates without evidence of chronic disease who died acutely from nephropathies which had the potential for becoming chronic eg bilateral multicystic dysplastic kidneys and human immunodeficiency virus (HIV) nephropathy. The date of entering CRF was defined as the first time the diagnostic serum creatinine levels were obtained.

Parishes of origin, age at first presentation with renal disease, age at presentation with CRF and diagnosis were recorded. Children were deemed to have chronic glomerulonephritis if the history and laboratory data were suggestive of glomerulonephritis but renal failure was too advanced for histological confirmation of the diagnosis. Reflux nephropathy (RN) was defined as primary when due to isolated vesicoureteric reflux (VUR) and secondary when VUR was associated with other urological malformations. Demographic data were based on the 1991 census and incidence expressed as the cumulative annual incidence /million child population under the age of 12 years, using population estimates for the mid-study year 1992 (3).

RESULTS

All paediatricians and paediatric surgeons responded. It was their opinion that all patients < age 12 years with CRF had been referred to either UHWI or BCH, but this could only be verified in one of the five hospitals outside of KSA by medical records search because of disorganization in their medical records department and possible mis-coding of diagnoses. The eastern end of the island has no paediatricians, but the assumption was made that difficult paediatric cases would have been referred to either BCH or UHWI from the outlying hospitals.

Thirty-four children who fulfilled inclusion criteria were identified. The mean age at diagnosis of CRF was six years three months (range 5 days-11 years 10 months). Six children were 0-12 months old when CRF was recognized. Twenty one (62%) were male. Nineteen of the children (56%) originated from parishes outside of KSA, including those parishes not served by a paediatrician. The cumulative annual incidence was 3.2/million children under 12 years of age, or 0.88/million total population. Approximately two to three new cases were diagnosed each year.

The primary diseases causing CRF during the period January 1985 to December 2000 are presented in Table 1. Obstructive uropathy, reflux nephropathy (RN), renal dysplasia and chronic pyelonephritis (CPN) were the causes of CRF in 41.2% of the total series and 62.5% of the children ≤ age 5 years. All but two cases of obstructive uropathy were secondary to posterior urethral valves (PUV). Four of the 11 children with obstructive uropathy and/or RN were diagnosed after the age of five years. Five children (14.7%) had RN, which was post obstructive in four.

Glomerulonephritis (GN) was the most common cause of CRF overall (50%) and was the cause of CRF in 77.7% of those children between ages 6 and 11 years. Eight of the 17 children with GN (44%) were already in advanced renal failure at first presentation to UHWI with renal disease, and histological diagnosis was not possible (chronic GN). In two of these, the CRF may have resulted from unresolved poststreptococcal glomerulonephritis (PSGN) - based on the history in one child and the post-mortem findings of previously unrecognized rheumatic heart disease in the other. In two children (classified as "other" in Table 1), hypocomplementaemia, haematuria, proteinuria with casts, or prior history of GN attested to the glomerulonephritic nature of the underlying disease, but no further diagnostic clues were identified.

Focal segmental sclerosis and membranoproliferative glomerulonephritis (MPGN) were the two identifiable types of glomerular disease leading to CRF. Two of the three cases of MPGN were diagnosed and treated late.

Post infectious GN (secondary to cytomegalovirus, HIV, human T-cell lymphotropic virus-1 (HTLV-1) and PSGN) was suspected or proven in nine children (26.5%). One child had sickle β_0 thalassaemia, secondary syphilis, serological evidence of PSGN, and MPGN on histology. PSGN was suspected in four children with CRF (11.8%). The fourth child with possible PSGN had presented two

Table 1: Primary renal disease in 34 children with chronic renal failure during the period 1985-2000

Primary renal disease	%	No of patients Age	
		≤ 5 years	6-11 years
Reflux nephropathy (RN) / obstructive uropathy / chronic pyelonephritis / renal dysplasia	41.2		
Primary RN		0	1
Posterior urethral valves			
With RN		1	2
Without RN		5	1
Neurogenic bladder obstruction with RN		1	0
Pelvi-ureteric junction obstruction dysplasia		1	0
Isolated renal dysplasia		1	0
Chronic pyelonephritis		1	0
Hereditary renal disease	2.9		
Bartter's syndrome		1	0
Other	5.9		
Birth asphyxia / unknown		2	0
Glomerulonephritis (GN)	50		
Chronic		1	7
Focal segmental glomerulosclerosis		0	2
Mesangial proliferative GN with focal sclerosis		0	2
Membranoproliferative GN		0	3
Other		2	0
Total	**100**	**16**	**18**

years earlier with nephrotic syndrome following skin sepsis. No serological data was available but renal biopsy, performed months after the initial presentation, showed focal segmental glomerulosclerosis.

The mean interval from presentation with renal disease to diagnosis of chronic renal failure was 1.6 years in the 33 patients in whom this information was available. Seventeen children were already in chronic renal failure at the time of first presentation to UHWI or BCH, and of these 11 (65%) were from parishes outside of KSA. Glomerulonephritis was the aetiology in nine (53%) and RN /Obstructive uropathy /renal dysplasia in five (29%) of these 17 cases. The mean age at death was seven years seven months (range 1 month to 14 years 1 month) in the 18 children in whom the data were documented. The mean interval from the diagnosis of CRF to death was 16 months (range 1 month to 9 years 5 months). Eleven children died < 6 months after CRF had been diagnosed.

During the period under study, 22 (64.7%) of the children either died (55.9%) or are presumed dead (8.8%) based on their last recorded urea and creatinine measurements. Three were lost to follow up. Fourteen children (45.1%) died before their 12th birthday. Only four children could be dialysed before the age of 12 years - three were haemodialysed locally in the adult programme (one privately and two in the public health system), and one was haemodialysed and transplanted in Canada. One of these locally dialysed children was transplanted at age 13 years but died 3 1/2 months later from sepsis, acute rejection and cardiac complications of end stage renal disease. Another died of catheter related sepsis at age 12 years.

DISCUSSION
The study is limited by our inability to verify that the patients identified truly represented the total number of children with CRF in the island. Because of the deficiencies in the medical records departments of our local hospitals, and the fact that general practitioners in rural areas may not have referred cases of CRF for nephrology consultation, our numbers are likely to be an underestimate. The records of patients seen at UHWI are presumed to be complete as the independent records of patients with CRF have been kept since December 1984 by the attending paediatric nephrologist. Within the limitations of the study, however, the data do give an idea, though likely understated, of the extent of childhood CRF in Jamaica.

Comparison with other studies of CRF is limited by differences in the criteria used to define CRF and the age ranges used in various studies of childhood CRF. Our cumulative annual incidence of 3.2 per million population < 12 years is likely to be an underestimate because of the previously documented shortcomings. In France (4) and Sweden (5) the annual incidence is 10.5 and 7.7 per million children below age 16 years, while in Chile (6) the annual incidence is 5.7 /million child population < 18years. Our

figures would more closely approximate the Chilean experience, if the difference in the population age is taken into consideration.

Late diagnosis of renal disease and late referral for paediatric nephrology consultation would explain why 50% of the cases were already in renal failure at first presentation, and why the majority of such children were from rural parishes.

This study confirms that the majority of cases are due to potentially treatable illnesses -namely GN, PUV/RN /CPN. In our series, reflux nephropathy accounted for 14.7% of cases of CRF, but in only 2.9% (one patient) was VUR primary. Primary VUR is said to be rare in blacks and is not seen in Nigerian children (7). West et al (8) documented VUR in 10% of 50 Jamaican children undergoing micturating cystograms (MCUG) for various reasons, and concluded that the frequency of VUR was low in our population. However in only 78% of these children was the MCUG performed in the course of investigating UTI. Had the percentage of cases of VUR in the UTI population been calculated, it is possible that the frequency of VUR may have been higher. The true incidence of primary VUR in Jamaican children is therefore unknown and formal studies to ascertain this, are overdue. Obstruction-related reflux nephropathy, however, accounted for 11.7% of children with CRF. Obstruction and reflux were diagnosed late in one third of the children.

Over the past few decades, appreciation of the natural history of paediatric UTI, and risk factors for subsequent renal parenchymal damage (including VUR and obstruction), has led (in developed countries, primarily), to the adoption of policies which result in the prompt and thorough evaluation of UTI (9). VUR and obstructive uropathy, which both have the potential for progressive renal damage, often present as UTI, and could be diagnosed and treated earlier if visualization of the urinary tract were obtained at the time of diagnosis of the first UTI. Prompt intervention can prevent or retard the progression to renal failure (9-11). In Sweden, where there has been an aggressive protocol of investigation and management of childhood UTI, the incidence of RN has fallen from 6% in their 1978 –1985 series to 0% in the 1986 – 1994 review (5).

Our study has shown that potentially treatable urological anomalies are diagnosed late. In Jamaica, UTIs are often missed by first-line physicians, and when diagnosed are frequently not investigated. We recommend that there should be, among physicians caring for children, a higher index of suspicion for UTI, especially in children for whom the cause of fever is not immediately apparent. All children should be investigated after their first UTI, regardless of their gender. Renal ultrasound and MCUG are recommended for children aged < 5 years and renal ultrasound for those aged > 5 years. Where there is a high suspicion of additional urological pathology by virtue of clinical parameters or abnormal preliminary radiology –

MCUG and renal scan should be included in the work-up, regardless of the child's age. Children with abnormalities should be referred for specialist paediatric consultation – nephrology, urology or surgery, depending on the nature of the abnormality detected. More thorough investigation of children with UTI would detect earlier, the urological abnormalities which may otherwise eventually result in chronic renal failure. Adoption of the policy to omit MCUG from the investigation of first UTI in children < 5 years of age, as practised in developed countries, where uropathology is usually diagnosed in infancy and early childhood, cannot be safely adopted in Jamaica.

Compared with other series in the developing and developed world, the 50% incidence of GN in this study is the highest (16.3 % in Chile (6), 22% - 24 % in Turkey (12), France (4) and North America (13), 37.5% in India (14). Late diagnosis and therefore late treatment of potentially reversible glomerular disease are certainly factors contributory to the relatively high incidence observed in our series. It has been well documented that early therapeutic intervention in certain types of glomerulonephritis, may improve the ultimate outcome by preventing or retarding the rate of progression to CRF. Such diseases include systemic lupus erythematosus (15), focal segmental glomerulosclerosis (16), membranoproliferative glomerulonephritis (17) and crescentic nephritis (18). Baldwin *et al* (19) have found that PSGN can result in chronic renal disease. Although PSGN was suspected as being contributory to CRF in 11.8% of our children, there is no objective data to substantiate our suspicions. Although PSGN usually has an excellent prognosis, the practitioner should appreciate that not all cases of AGN are poststreptococcal, and be able to recognize and refer early, for nephrology consultation, those cases of suspected PSGN who present atypically with severe, persistent hypertension, marked, progressive renal impairment or who fail to follow the normal course of resolution of PSGN (20), as these may have superimposed crescentic GN or may in fact be MPGN. Although it is generally accepted that most cases of childhood nephrotic syndrome are due to minimal change nephrotic syndrome, features such as anaemia, hypertension, gross haematuria, renal failure and abnormal serology are not typical of minimal change (21). Atypical cases should be referred early for nephrology consultation.

In summary, in Jamaica, childhood chronic renal disease could be prevented by prompt investigation and appropriate treatment of UTI and GN. Although primary care physician/ paediatrician education through island-wide seminars have improved local awareness of diseases likely to result in CRF, and encouraged early referral of atypical cases to the paediatric nephrology centres at UHWI and BCH, there are still many parts of the island where this information is unknown. More has to be done in this regard. CRF at the present time remains a death sentence for Jamaican children < 12 years of age. Public education needs to go hand in hand with plans for establishing a dialysis / transplantation facility for the paediatric population.

ACKNOWLEDGEMENTS

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