Chronic Renal Failure in Jamaican Children – an Update (2001–2006)

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ABSTRACT

Objective: *This study evaluated the incidence, epidemiology, aetiology and outcome of chronic renal failure (CRF) in Jamaican children < 12 years old between 2001 and 2006.*

Methods: *The required data on all children who fulfilled inclusion criteria were obtained from their medical records at the University Hospital of the West Indies, Bustamante Hospital for Children and from practitioners in hospitals serving children islandwide.*

Results: *Eighteen new children (72.2% male) presented with CRF. The cumulative annual incidence was 4.61/million child population under age 12 years or 1.14/million total population. Congenital urological disease (44.5%) was the commonest cause of CRF, followed by glomerulonephritis (33.3%). Half of the cases of glomerulonephritis were secondary to HIV-associated nephropathy. Although all children with posterior urethral valves were diagnosed before age 6 months and promptly treated, renal failure present at birth proved irreversible. The mean age at diagnosis of CRF was 6.72 years. Ten children (55.6%) were already in CRF at first presentation with renal disease. Of these, the five with non-urological disease were already in End Stage Renal Disease (ESRD). Mortality was 44.4%. Five children died in ESRD without the benefit of dialysis.*

Conclusion: *The incidence of CRF has increased from the 1985–2000 local study and is mainly due to urological pathology which progresses despite early diagnosis and treatment. Non-urological renal disease is presenting too late for therapeutic intervention. Greater public awareness of symptoms of renal disease is needed. Children's access to dialysis is unpredictable. A paediatric dialysis and transplantation programme is needed.*

Insuficiencia Renal Crónica en Niños Jamaicanos – Actualización (2001–2006)

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RESUMEN

Objetivo: *Este estudio evaluó la incidencia, epidemiología, etiología y resultado de la insuficiencia renal crónica (IRC) en niños jamaicanos menores de 12 años entre 2001 y 2006.*

Métodos: *Los datos requeridos sobre los niños que satisfacían los criterios de inclusión, fueron obtenidos a partir de sus historias clínicas en el Hospital Universitario de West Indies y en el Hospital Pediátrico Bustamante, así como a partir de médicos en hospitales que prestan atención a niños en todo el país.*

Resultados: *Dieciocho nuevos niños (72.2% varones) presentaron IRC. La incidencia acumulada anual fue de 4.61 por millón de población infantil menor de 12 años de edad o 1.14 por millón de población total. La enfermedad urológica congénita (44.5%) fue la causa más común de IRC, seguida por la glomerulonefritis (33.3%). La mitad de los casos de glomerulonefritis fueron secundarios a la nefropatía asociada al VIH. Aunque todos los niños con válvulas uretrales posteriores fueron diagnosticados antes de los 6 meses de edad y puestos bajos tratamiento, la insuficiencia renal presente al nacer resultó irreversible. La edad promedio al momento del diagnóstico de la IRC fue 6.72 años. Diez niños (55.6%) se hallaban ya con IRC desde que se les presentara inicialmente la enfermedad renal. De estos, los cinco con enfermedad no urológica se hallaban ya en la fase terminal de la enfermedad renal (ERT). La mortalidad fue de 44.4%. Cinco niños murieron en la ERT sin el beneficio de la diálisis.*

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Conclusión. *La incidencia de la IRC ha aumentado desde el estudio local de 1985–2000, principalmente debido a patologías urológicas que progresan a pesar del diagnóstico precoz y el tratamiento. La enfermedad renal no urológica se está presentando demasiado tarde para una intervención terapéutica. Se requiere mayor conciencia pública de los síntomas de la enfermedad renal. El acceso de los niños a la diálisis es imprescindible. Hace falta una diálisis infantil y un programa de transplante.*

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INTRODUCTION

Jamaica is an island in the Western Caribbean with a total population, based on the 2001 census, of 2.67 million people, of whom 22.4% are children < 12 years old (1). The island is divided administratively into 14 parishes. Chronic renal failure (CRF) is a cause of morbidity for Jamaican children, with a mortality of 65% based on statistics from 1985–2000 (2) as there is no established dialysis /transplantation programme for children locally. Paediatric nephrology services are only available in the commercial centre of the island, Kingston and St Andrew (KSA), at the Bustamante Hospital for Children (BHC) and the University Hospital of the West Indies (UHWI). All cases of CRF are expected to be referred to these centres from outlying hospitals islandwide. In the previous local review (2), CRF in Jamaican children was mainly due to potentially curable illnesses [urological pathology and glomerulonephritis (GN)], with 50% of children being in CRF at first presentation with renal disease.

The present study documents the incidence, epidemiology and aetiology of chronic renal failure in Jamaican children < 12 years old between 2001 and 2006 and compares the data with that of the previous study and the world literature.

SUBJECTS AND METHODS

The study population consisted of all Jamaican children diagnosed for the first time with CRF at age < 12 years between January 2001 and December 2006. The data were collected from the records of such children attending BHC and UHWI. In addition, paediatricians, paediatric surgeons and physicians who serve children in public hospitals islandwide were contacted and asked to complete a questionnaire supplying data on children in their care with CRF who had not been previously referred to either BHC or UHWI. The study was approved by the Ethics Committee of the University of the West Indies/University Hospital of the West Indies.

The following were documented: parish of origin, gender, age at diagnosis of renal disease and at diagnosis of CRF, interval between diagnosis of renal disease and onset of CRF, aetiology and incidence of CRF, as well as outcome data. Chronic renal failure was defined as glomerular filtration rate (GFR) < 50 ml/min/1.73m^2 for at least 3 months **or** for less than 3 months if there was clinical or radiological evidence of CRF. Glomerular filtration rate was calculated using the Schwartz formula (3). The date of onset of CRF was recorded as the date of first GFR < 50ml/min/1.73m^2. Demographic data were based on the 2001 population census, using population estimates for the mid study year 2003, and incidence expressed as the cumulative annual incidence per million age-related population (PMARP) and the cumulative annual incidence per total population (1). For the purpose of comparison, incidence was also calculated in the susceptible population, using the CRF criteria of the previous study: serum creatinine (Scr) >133?mol/L in children < age 2 years and > 175 ?mol/L in children > age 2 years (2). The cause of CRF was classified as "unknown" in patients presenting with End Stage Renal Disease (ESRD) and no diagnostic clues. The diagnosis of HIV-associated nephropathy (HIVAN) was clinical rather than histological.

RESULTS

All physicians contacted had referred their CRF patients to BHC or UHWI. Eighteen children < 12 years old presented with CRF in the period 2001–2006 using either CRF criterion. There were 13 males (72.2%). The cumulative annual incidence was 4.61 PMARP or 1.14/million total population. One child with CRF in this period was transplanted and again developed CRF one year later. He was treated as a single case. Seven of the 18 children (38.9%) came from KSA followed in frequency by St Catherine (three), Westmoreland (two) and one case each from all the other parishes except Trelawny, Hanover, St Elizabeth and Portland. Eleven children were referred to UHWI and 7 to BHC.

The Table represents the primary renal diseases causing CRF in the study period. The commonest cause of CRF was urological pathology – 8 cases (44.5%), followed by GN- 6 cases (33.3%). Half of the GN cases were due to HIVAN which was the only type of post-infectious GN. The cause of CRF was unknown in three children who presented in ESRD. Urological pathology [62.5% of which was posterior urethral valves (PUV)] accounted for all cases of CRF in children less than 6 years of age while in children age 6 to less than 12 years GN was the most common cause (50%). The sole patient with neurogenic bladder (meningomyelocoele related) and recurrent urinary tract infections was only referred for nephrological investigation and management at age 10 years when in chronic renal failure. The only case of primary reflux nephropathy (RN) was a male whose renal disease was first diagnosed at age 10.1 years when he presented in CRF.

Table: Primary renal disease in 18 Jamaican children with chronic renal failure 2001–2006.

Primary renal disease		Number of patients	
		Age	
	%	< 6 years	6–11 years
Reflux nephropathy (RN)/ Obstructive uropathy/renal dysplasia (8)	44.5		
Posterior urethral valves (5)			
With RN		3	0
Without RN		2	0
Primary RN		0	1
Isolated renal dysplasia		1	0
Neurogenic bladder		0	1
Glomerulonephritis (6)	33.3		
Chronic		0	2
Focal segmental glomeruloscerosis		0	1
HIVAN		0	3
Other (4)	22.2		
Sarcoidosis		0	1
Unknown		0	3
Total	**100**	**6**	**12**

In 7/18 (38.9%) of children, renal disease was first diagnosed at age < 1 year. Of these, six (85.7%) were urological – renal dysplasia and PUV – RN. The mean age at diagnosis of CRF was 6.72 years (range 1 month – 11.8 years) and the mean interval from diagnosis of renal disease to CRF was 10.8 months (range 0 – 6.4 years). Ten children (55.5%) were already in CRF at first presentation with renal disease. Of these, five (non-urological) were already in ESRD of which the cause was unknown in three. In the remaining five children (urological), PUV had been diagnosed at a mean age of 2 months but, despite early intervention, renal failure progressed.

The overall mortality in the series was 44.4% (8 cases). Five of these (62.5%) died in ESRD without the benefit of dialysis. The other deaths were attributed to a hypertensive crisis, sepsis and HIV-related cardiomyopathy respectively. One haemodialysed boy was transplanted at age 9 years in 2001 (the first renal transplant < 12 years old) and is now again in CRF from chronic rejection resuming dialysis in 2009. In the UHWI series with CRF, 3 of the 11 children died. Two deaths were ESRD-related, making the ESRD mortality 18.2%. At BHC the overall mortality was 71.4% (5/7) and the ESRD mortality was higher at 42.8%. At UHWI 4/11 children were haemodialysed compared with only 1/7 at BHC. The mean interval from diagnosis of renal disease to death in the 16 patients in whom this information was available, was 22 months (range 2 months to 54 months).

DISCUSSION

The cumulative annual incidence PMARP was higher (4.61) than the 3.2 of the previous study (2). Comparison of the incidence of CRF in children worldwide is difficult, as there is no uniformity in the criteria used to define CRF or the age classified as “childhood”. The incidence of CRF in Jamaica is deemed to be as low as it is in Nigeria (4) and Japan (5) [3–4 PMARP]. Countries with intermediate incidence (PMARP between 7.7–10) include Sweden, Venezuela and Europe (6–8). The incidence is high (PMARP 12.1–15) in the United States of America (9) and Italy (10).

Most children were from KSA (the commercial heart of the island) where the population density is highest. There were no referrals from 4 of the 14 parishes. Although it is possible that renal failure is less common in these areas, there were generally no referrals from parishes without a paediatric service so under-diagnosis is more likely. In this study, as in the literature (4, 10–12), males predominated – a feature ascribed to the higher incidence of congenital urological abnormalities in males.

Urological pathology caused CRF 44.5% [similar to the earlier study (41.1%)] but in the current series was the most common cause of CRF, followed by GN (33.3%). Urological disease is the leading cause of CRF in India, Iran, North America and Italy (10, 11–13). In the 1985–2000 data (2), glomerulonephritis was the commonest cause of CRF (50%), while in the current series this diagnosis was made in only 6 cases. However, this number may be falsely low as some of the children who presented with disease too advanced for diagnosis may conceivably have had chronic glomerulonephritis.

In children aged 6–11 years, glomerulonephritis was still the commonest cause of CRF. In a previous study (2), post-infectious GN (particularly Poststreptococcal Glomerulonephritis – PSGN) was thought to be aetiological in 9 of 34 children (26.5%) and there was only one case of HIVAN. Now, the only associated infection was HIV which accounted for 16.7% of the total. The absence of PSGN in this series may reflect the reduced frequency of PSGN as well as success in educating physicians to recognize and refer atypical presentations of GN. In the Nigerian study (4) 1985–2000, the frequency of GN in CRF (53.3%) was similar to the Jamaican study in the same period (2) but the authors recorded no case of HIVAN. In earlier studies, effective antiretroviral therapy was not widely available and many HIV-infected children did not survive long enough to develop CRF.

Four children (22.2%) in this series presented with VUR related renal disease (RN), compared with five (14.7%) in the previous study (2). In both studies, primary RN was diagnosed in only one child. Primary VUR was uncommon in both Jamaican series, is said to be rare in blacks and is not seen in Nigeria (14). In Nigeria (4) there was no case of CRF

secondary to VUR, while in Iran (12) and Italy (10) RN (most commonly primary) was the single commonest cause of CRF (25.9% and 25% respectively). In Jamaica, since 1985, we have adopted an aggressive approach to investigating children after the first urinary tract infection, and urological pathology is now being diagnosed and treated earlier. Posterior urethral valves (PUV) is now virtually the only obstructive uropathy observed. However, despite early diagnosis at a mean age of 2 months, infants with PUV – VUR continue to progress to CRF despite intervention. This observation has been well-documented in other series (10, 15). It is proposed that renal dysplasia and hypoplasia resulting from obstruction and/or VUR may have common embryological origins ["bud theory"] (16–18). The process of abnormal development may begin as early as five weeks gestation, so in certain infants even intra-uterine surgery will not prevent chronic renal disease.

The majority of patients (10/18, 55.5%) were already in CRF at first presentation with renal disease – similar to the earlier study (2) of fifty per cent. Five were urological. The non-urological children were in ESRD when they first presented. It appears that patients with non-urological disease do not interface with health services until pathology is irreversible. There needs to be greater public awareness of the symptoms and signs of renal disease so that medical contact and intervention might be promptly instituted. This pattern of late referral has also been observed in Syria (19) and India (11).

Mortality was lower in this series (44.4%) than the 65% of the previous study (2) as more children were able to access dialysis. However death from CRF is more the rule than the exception as dialysis availability depends on the ability of the overburdened adult programme to accept a child for treatment. Dialysis was less accessible for children at BHC where the ESRD mortality was more than twice that at UHWI. In Nigeria (4) the in-hospital mortality was 46.7% as there were no facilities for renal replacement therapy prior to 2000. In India, while all are offered dialysis/transplantation, few can afford the facility as it is not state-funded (11).

In summary, CRF in Jamaican children is now predominantly due to urological pathology which seems largely unpreventable. Non-urological renal disease is being diagnosed late. Greater public awareness of the symptoms of renal disease is needed. Mortality in children with CRF remains high as access to renal replacement in the adult programme is unpredictable and sporadic. A dialysis/transplant programme for children is needed.

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REFERENCES

1. Statistical Institute of Jamaica. Demographic Statistics 2006.
2. Miller MEY, Williams JA. Chronic renal failure in Jamaican children. West Indian Med J 2002; **51:** 220–4.
3. Schwartz GJ, Haycock GB, Edelmann CM Jr, Spitzer A. A simple estimate of glomerular filtration rate in children derived from body length and plasma creatinine. Pediatrics 1976; **58:** 259–63.
4. Anochie I, Eke F. Chronic renal failure in children: a report from Port Harcourt, Nigeria (1985–2000). Pediatr Nephrol 2003; **18:** 692–5.
5. Hattori S, Yosioka K, Honda M, Ito H. Japanese Society for Pediatric Nephrology. The 1998 report of the Japanese National Registry data on pediatric end-stage renal disease patients. Pediatr Nephrol 2002; **17:** 456–461.
6. Esbjorner E, Berg U, Hansson S. Epidemiology of chronic renal failure in children: a report from Sweden 1986–1994. Pediatr Nephrol 1997; **11:** 438–442.
7. Orta-Sibu N, Lopez M, Moriyon JC, Chavez JB. Renal diseases in children in Venezuela, South America. Pediatr Nephrol 2002; **17:** 566–9.
8. van der Heijen BJ, van Dijk PC, Verrier-Jones K, Jager KJ, Briggs JD. Renal – therapy in children: data from 12 registries in Europe. Pediatr Nephrol 2004; **19:** 213–21.
9. US renal data system, USRDS 2005 Annual data report: Atlas of end-stage renal disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD.
10. Ardissino G, Dacco V, Testa S, Bonaudo R, Claris-Appiani A, Taioli E et al. Epidemiology of chronic renal failure in children: data from the ItalKid project. Pediatrics 2003; **111:** e382–e387.
11. Hari P, Singla IK, Mantan M, Kanitkar M, Batra B, Bagga A. Chronic renal failure in children. J Indian Pediatr 2003; **40:** 1035–1042.
12. Madani K, Otoukesh, Rastegar A, Van Why S. Chronic renal failure in Iranian children. Pediatr Nephrol 2001; **16:** 140–144.
13. North American Pediatric Renal Transplant Cooperative Study (NAPRTCS). 2005 annual report. The EMMES Corporation, Rockville, MD.
14. Eke FU, Eke NN. Renal disorders in children: A Nigerian study. Pediatr Nephrol 1994; **8:** 383–6.
15. Roth KS, Carter WH, Chan JCM. Obstructive nephropathy in children: long-term progression after relief of posterior urethral valve. Pediatrics 2001; **107:** 1004–10.
16. Mackie GG, Stephens FD. Duplex kidneys: a correlation of renal dysplasia with position of the ureteral orifice. J Urol 1975; **114:** 274–280.
17. Henneberry MO, Stephens FD. Renal hypoplasia and dysplasia in infants with posterior urethral valves. J Urol 1980; **123:** 912–15.
18. Sommer JT, Stephens FD. Morphogenesis of nephropathy with partial ureteral obstruction and vesicoureteral reflux. J Urol 1981; **125:** 67–72.
19. Saeed MBA. The major causes of chronic renal insufficiency in Syrian children: a one-year, single center experience. Saudi J Kidney Dis Transplant 2005; **16:** 84–8.