CHAPTER 4

Paediatric Renal Biopsies

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4.1: Introduction

Chapter 4 reports on renal biopsies done in children less than 15 years of age in Malaysia. All native renal biopsies from 2005 to 2012 on children were reported .

4.2: Number of patients and renal biopsies

4.2.1: Total number of patients and native renal biopsies

A total of 1224 renal biopsies were performed in 1113 children.

4.2.2: Number of patients from various hospitals

The majority of renal biopsies were performed in the Ministry of Health hospital 96.3%. (Table 4.2.2)

Table 4.2.2: Number of patients from various hospitals

	2005-2010		2011		2012		All	
Hospitals	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Hospital Kuala Lumpur	191	24.2	32	18.5	34	22.0	257	23.0
Other MOH Hospitals	573	73.0	123	71.5	118	76.0	814	73.3
University Hospital	7	0.9	13	7.6	3	2.0	23	2.0
Army Hospital	1	0.1	0	0	0	0	1	0.1
Private Hospital	14	1.8	4	2.4	0	0	18	1.6
Total	**786**	**100**	**172**	**100**	**155**	**100**	**1113**	**100**

4.2.3: Number of native renal biopsies

Currently, the number of biopsies per year is 160-180. (Table 4.2.3)

Table 4.2.3: Number of renal biopsies

Year	n	%
2005-2010	882	72.1
2011	184	15.0
2012	158	12.9
Total	**1224**	**100.0**

4.2.4: Number of renal biopsy done on each individual patient

It was the first renal biopsy for 87.2% of patients. (Table 4.2.4)

Table 4.2.4: Distribution of native renal biopsy in patients by number of attempts

Total number of biopsy/ patient	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
1st episode	768	87.1	157	85.3	142	89.9	1067	87.2
2nd	90	10.2	25	13.6	10	6.3	125	10.2
3rd	21	2.4	2	1.1	5	3.2	28	2.3
>4th	3	0.3	0	0.0	1	0.6	4	0.3
Total number of Patient	**882**	**100.0**	**184**	**100.0**	**158**	**100.0**	**1224**	**100.0**

4.3: Outcome of renal biopsies

4.3.1: Adequacy of renal biopsy for diagnosis

Altogether of 1170 (95.6%) renal biopsies were assessed to be adequate for diagnosis upon review by histopathologists and nephrologists. A total of 54 (4.4%) biopsies were not conclusive. (Table 4.3.1)

Table 4.3.1: Conclusive report

Year	Total number of biopsies	Report conclusive		Report not conclusive	
		n	%	n	%
2005-2010	882	851	96.5	31	3.5
2011	184	167	90.8	17	9.2
2012	158	152	96.2	6	3.8
Total	**1224**	**1170**	**95.6**	**54**	**4.4**

4.3.2: Number of glomeruli obtained at each biopsy

Most of the biopsies (78.8%) yield 10 or more glomeruli. (Table 4.3.2)

Table 4.3.2: Number of glomeruli obtained at each biopsy

Year	Total number of biopsies (Data available)	≥ 10 Glomeruli		< 10 Glomeruli	
		n	%	n	%
2005-2010	882 (877)	693	79.0	184	21.0
2011	184 (182)	133	73.1	49	26.9
2012	158 (156)	132	84.6	24	15.4
Total	**1224 (1215)**	**958**	**78.8**	**257**	**21.2**

**9 cases with missing number of glomeruli*

4.4: Patient characteristics

Table 4.4.1 shows that renal biopsies were performed on 548 (49.2%) boys and 565 (50.8%) girls. Sixty-four percent patients were Malay, 18.2% Chinese, 6.9% Indian and 11.0% were of other race. The mean age at biopsy was 9.8 ± 4 years. (Table 4.4.2)

Table 4.4.1: Gender and racial distribution

		2005-2010		2011		2012		All	
		n	%	n	%	n	%	n	%
Gender	Male	378	48.1	94	54.7	76	49.0	548	49.2
	Female	408	51.9	78	45.4	79	51.0	565	50.8
	Total	**786**	**100.0**	**172**	**100.0**	**155**	**100.0**	**1113**	**100.0**
Race	Malay	480	61.1	120	69.8	112	72.3	712	64.0
	Chinese	154	19.6	26	15.1	21	13.6	201	18.1
	Indian	61	7.8	9	5.2	7	4.5	77	6.9
	Others*	91	11.5	17	9.9	15	9.6	123	11.0
	Total	**786**	**100.0**	**172**	**100.0**	**155**	**100.0**	**1113**	**100.0**

** inclusive of 11 foreigners*

Table 4.4.2: Age distribution

Age (years)	2005 - 2010	2011	2012	All
n	882	184	158	1224
Mean	9.82	9.63	9.66	9.77
Standard deviation	3.88	4.32	4.28	4.00
Minimum	0.25	0.23	0.13	0.13
Maximum	14.99	14.98	14.97	14.99

4.5: Clinical presentation

4.5.1: Clinical presentation at biopsy

Nephrotic syndrome was the most frequent clinical presentation accounting for 50.0%. (Table 4.5.1)

Table 4.5.1: Clinical presentation at biopsy

Clinical presentation	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Asymptomatic urine abnormalities	161	18.3	35	19.0	27	17.1	223	18.2
Nephritic syndrome	109	12.4	28	15.2	21	13.3	158	12.9
Nephrotic syndrome	455	51.6	83	45.1	74	46.8	612	50.0
Nephritic nephrotic syndrome	92	10.4	28	15.2	22	13.9	142	11.6
Not available	54	6.1	6	3.3	7	4.4	67	5.5
Missing	11	1.3	4	2.2	7	4.4	22	1.8
Total	**882**	**100.0**	**184**	**100.0**	**158**	**100.0**	**1224**	**100.0**

4.5.2: Renal function at biopsy

Altogether 30.1% of the patient had renal impairment at the time of biopsy. (Table 4.5.2)

Table 4.5.2: Renal function at biopsy

Renal function at biopsy	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Impaired	269	30.5	59	32.1	40	25.3	368	30.1
Normal	563	63.8	111	60.3	106	67.1	780	63.7
Not available or missing data	50	5.7	14	7.6	12	7.6	76	6.2
Total	**882**	**100.0**	**184**	**100.0**	**158**	**100.0**	**1224**	**100.0**

4.5.3: Hypertension at biopsy

Hypertension was found in 37.2% of patients. Calcium channel blockers and angiotensin converting enzyme inhibitors were the more frequently used antihypertensive drugs. (Table 4.5.3(a)&(b))

Table 4.5.3(a): Hypertension at biopsy

Hypertension At biopsy	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Present	306	34.7	85	46.2	64	40.5	455	37.2
Absent	546	62.2	85	46.2	82	51.9	716	58.5
Not available or missing data	27	3.1	14	7.6	12	7.6	4.3	4.3
Total	**882**	**100.0**	**184**	**100.0**	**158**	**100.0**	**1224**	**100.0**

Table 4.5.3(b): Type of antihypertensive drugs

Type of antihypertensives	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
ACEI	103	33.7	41	48.2	30	46.9	174	38.2
Alpha Blocker	40	13.1	1	1.2	9	14.1	50	11.0
ARB	9	2.9	4	4.7	3	4.7	16	3.5
B Blocker	55	18.0	11	12.9	13	20.3	79	17.4
Calcium Channel Blocker	161	52.6	44	51.8	40	62.5	245	53.8
Others	44	14.4	40	47.1	41	64.1	125	27.5
No drug available	84	27.5	1	1.2	1	1.6	86	18.9

4.6: Diagnosis of paediatric renal biopsies

Lupus nephritis contributed the largest group of renal histopatholocial diagnosis at 25.0%. This was followed by focal segmental glomerulosclerosis (FSGS) at 21.4% and minimal change disease (MCD) at 20.5%. There was increased in the frequency of FSGS; 20.7% in 2011 and 26.3% in 2012. In addition there was 8% difference in incidence of MCD; 26% in 2011 and 17.5% in 2012. Post-infectious glomerulonephritis (GN) was diagnosed in 7.7%. IgA nephropathy accounted for 6.3% and Henoch Scholein Purpura 2.6%. (Table 4.6.1)

Table 4.6: Diagnosis of paediatric renal biopsies

Diagnosis	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Lupus nephritis	225	25.6	35	20.7	42	26.3	302	25.0
FSGS	205	23.3	22	13.0	32	20.0	259	21.4
MCD	175	19.9	45	26.6	28	17.5	248	20.5
Post-infectious GN	60	6.8	19	11.2	14	8.8	93	7.7
IgA nephropathy	50	5.7	13	7.7	13	8.1	76	6.3
Henoch Schonlein Purpura	26	3.0	3	1.8	2	1.3	31	2.6
Mesangial proliferative GN non-IgA	16	1.8	8	4.7	5	3.1	29	2.4
Advanced glomerulosclerosis (advance GN)	25	2.8	3	1.8	4	2.5	32	2.6
HUS/TTP	3	0.3	0	0.0	0	0.0	3	0.2
Membranoproliferative GN	9	1.0	3	1.8	1	0.6	13	1.1
Acute tubular necrosis	19	2.2	3	1.8	1	0.6	23	1.9
Vasculitis (systemic vasculitis)	6	0.7	0	0.0	0	0.0	6	0.5
Membranous nephropathy	13	1.5	4	2.4	0	0.0	17	1.4
Chronic interstitial nephritis	8	0.9	3	1.8	1	0.6	12	1.0
Acute interstitial nephritis	5	0.6	1	0.6	3	1.9	9	0.7
Alport's syndrome	1	0.1	0	0.0	0	0.0	1	0.1
Thin basement membrane disease	1	0.1	0	0.0	0	0.0	1	0.1
Hereditary (others)	0	0.0	0	0.0	0	0.0	0	0.0
Benign/malignant hypertension	1	0.1	1	0.6	0	0.0	2	0.2
Malignancy	1	0.1	0	0.0	0	0.0	1	0.1
Crescentic ANCA	2	0.2	0	0.0	0	0.0	2	0.2
Idiopathic crescentic GN	9	1.0	0	0.0	0	0.0	9	0.7
Anti GBM disease	1	0.1	0	0.0	0	0.0	1	0.1
Athero-embolic disease	1	0.1	0	0.0	0	0.0	1	0.1
Others	8	0.9	3	1.8	13	8.1	24	2.0
Unknown/Missing	4	0.5	2	1.2	1	0.6	7	0.6
Amyloidosis	0	0.0	1	0.6	0	0.0	1	0.1
Systemic vasculitis	6	0.7	0	0.0	0	0.0	6	0.5
Total	**880**	**100.0**	**169**	**100.0**	**160**	**100.0**	**1209**	**100.0**

**Patients may have more than 1 diagnosis classification*

4.7: Nephrotic syndrome

4.7.1: Renal histopathology diagnosis of children presenting with nephrotic syndrome

A total of 601 renal biopsies was performed in children with nephrotic syndrome. Table 4.7.1 shows that FSGS was found in 37.4% and MCD in 34.8%.

Table 4.7.1: Renal histopathology diagnosis of children presenting with nephrotic syndrome

Diagnosis	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
FSGS	178	39.6	19	25.0	28	37.3	225	37.4
MCD	145	32.2	40	52.6	24	32.0	209	34.8
Lupus nephritis	66	14.7	8	10.5	12	16.0	86	14.3
IgA nephropathy	12	2.7	2	2.6	1	1.3	15	2.5
Mesangial proliferative GN non-IgA	8	1.8	2	2.6	2	2.7	12	2.0
Post-infectious GN	4	0.9	2	2.6	1	1.3	7	1.2
Others**	37	8.2	3	3.9	7	9.3	47	7.8
Total	**450**	**100**	**76**	**100**	**75**	**100**	**601**	**100**

**Patients may have more than 1 diagnosis classification*
*** Others – Henoch Schonlein Purpura, HUS/TTP, Systemic vasculitis, Malignancy, Membranous nephropathy, Membrano-proliferative, Idiopathic crescentic GN, Acute interstitial nephritis, Acute tubular necrosis, Chronic interstitial nephritis, Heredity (others), Advance GN, Others (nephrotic n=612 but report conclusive for nephrotic n=589)*

4.7.2: The histopathological profile in different steroid response categories

The commonest histological finding for steroid sensitive nephrotic syndrome was MCD (44.4%), followed by FSGS (29.0%). FSGS was present in 43.3% of steroid resistant nephrotic syndrome biopsies, whereas MCD was observed in 34.1%. (Table 4.7.2)

Table 4.7.2: The histopathological profile in different steroid response categories

Diagnosis	2005-2010		2011	
	n	%	n	%
FSGS	36	29.0	109	43.3
MCD	55	44.4	86	34.1
Lupus nephritis	20	16.1	24	9.5
IgA nephropathy	1	0.8	6	2.4
Mesangial proliferative GN non-IgA	5	4.0	4	1.6
Post-infectious GN	1	0.8	1	0.4
Others**	6	4.8	22	8.7
Total	**124**	**100**	**252**	**100**

** P a t i e n t s*

may have more than 1 diagnosis classification
*** Others – Henoch Schonlein Purpura, Membranous nephropathy, Membrano-proliferative, Idiopathic crescentic GN, Acute interstitial nephritis, Acute tubular necrosis, Chronic interstitial nephritis, Advance GN, Others Missing of 8 cases with NA/ Missing between steroid responsive and steroid resistant*

4.8: Renal histopathology diagnosis of children presenting with nephritic syndrome

Renal biopsy was performed in 155 children with nephritic syndrome. The majority demonstrated post-infectous GN (25.2%), while the others had lupus nephritis (24.5%), FSFS (7.7%) and IgA nephropathy (7.1%). (Table 4.8)

Table 4.8: Renal histopathology diagnosis of children presenting with nephritic syndrome

Diagnosis	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Post-infectious GN	26	22.8	8	33.3	5	29.4	39	25.2
Lupus nephritis	30	26.3	3	12.5	5	29.4	38	24.5
IgA nephropathy	7	6.1	2	8.3	2	11.8	11	7.1
Henoch Schonlein Purpura	5	4.4	0	0.0	1	5.9	6	3.9
FSGS	9	7.9	2	8.3	1	5.9	12	7.7
MCD	7	6.1	0	0.0	0	0.0	7	4.5
Messangial proliferative GN-non lgA	3	2.6	2	8.3	0	0.0	5	3.2
Acute tubular necrosis	10	8.8	1	4.2	0	0.0	11	7.1
Others**	17	14.9	6	25.0	3	17.6	26	16.8
Total	**114**	**100**	**24**	**100**	**17**	**100**	**155**	**100**

**Patients may have more than 1 diagnosis classification*
*** Others – HUS/TTP, Anti GBM disease, Advance GN, Systemic vasculitis, Membrano-proliferative, Idiopathic crescentic GN, Acute interstitial nephritis, Chronic interstitial nephritis, Alport's syndrome (nephritic n=158 but report conclusive for nephritic n=151*

4.9: Causes of severe renal failure (needed dialysis therapy)

The causes of severe renal failure for patients who needed dialysis therapy at the time of biopsy were lupus nephritis (26%), FSGS (24.0%), advanced glomerulosclerosis (20.8%) ang IgA nephropathy (6.3%). (Table 4.9)

Table 4.9: Histology finding of children who had severe renal failure (needed dialysis therapy) who underwent renal biopsy

*

Diagnosis	2005-2010		2011		2012		All	
	n	%	n	%	n	%	n	%
Post-infectious GN	1	1.3	2	15.4	0	0.0	3	3.1
Lupus nephritis	22	28.6	2	15.4	1	16.7	25	26.0
FSGS	21	27.3	2	15.4	0	0.0	23	24.0
Advanced glomerulosclerosis (advance GN)	15	19.5	2	15.4	3	50.0	20	20.8
HUS/TTP	0	0.0	0	0.0	0	0.0	0	0.0
Acute tubular necrosis	2	2.6	0	0.0	0	0.0	2	2.1
MCD	1	1.3	1	7.7	0	0.0	2	2.1
Acute interstitial nephritis	1	1.3	0	0.0	0	0.0	1	1.0
IgA nephropathy	5	6.5	0	0.0	1	16.7	6	6.3
Others*	9	11.7	4	30.8	1	16.7	14	14.6
Total	**77**	**100**	**13**	**100**	**6**	**100**	**96**	**100**

Membrano-proliferative, Messangial Proliferative GN-non lgA, Idiopathic Crescentic GN, Henoch scholein purpura, Systemic vasculitis, Malignancy, Chronic interstitial nephritis, Others
** Severe renal failure extracted from chronic impaired renal function*

4.10: Paediatric focal segmental glomerulosclerosis and minimal change disease

4.10.1: Characteristics of paediatric focal segmental glomerulosclerosis and minimal change disease among children with steroid resistant nephrotic syndrome.

There was no difference in term of age at presentation, BMI, urine albumin excretion rate and eGFR in children with FSGS or MCD. However, there were more Indian and more boys among those with minimal change disease. (Table 4.10.1)

4.10.1: Clinical characteristics of children with steroid resistant nephrotic syndrome, 2005-2012

Clinical characteristics		FSGS		MCD		*p*-value
		n	%	n	%	
Number		**105**	**42.5**	**79**	**32.0**	0.0563[a]
Age/year (mean (sd))		7.6	4.03	6.5	4.23	
Age/year(median (IQR))		7.3	6.42	5.14	7.51	
Race	Malay	71	67.6	59	74.7	0.012[b]
	Chinese	14	13.3	5	6.3	
	Indian	6	5.7	12	15.2	
	Others	14	13.3	3	3.8	
	Total	**105**	**100**	**79**	**100**	
BMI (mean (sd))		19.16	3.870	18.50	4.478	0.055[c]
Gender	Boy	66	62.9	55	69.6	0.339[d]
	Girl	39	37.1	24	30.4	
Gross haematuria	Present	4	3.8	1	1.3	0.381[e]
	Absent	92	87.6	77	97.5	
	Not available/Missing	9	8.6	1	1.3	
Hypertension	Present	48	46.6	26	32.9	0.062[f]
	Absent	55	53.4	53	67.1	
Family history	Yes	4	3.8	3	3.8	>0.995[g]
	No	100	95.2	73	92.4	
	Unknown/ missing	1	1.0	3	3.8	
eGFR ml/min/1.73m²	GFR <30	6	5.7	2	2.5	0.084[h]
	GFR 30-60	11	10.5	2	2.5	
	GFRl 60-90	10	9.5	7	8.9	
	GFR > 90	62	59.0	59	74.7	
	Missing	16	15.2	9	11.4	
Dialysis required	Yes	4	3.8	0	0.0	0.134[i]
	No	98	93.3	78	98.7	
	Unknown	3	2.9	1	1.3	
24HUP g/day (mean, sd)		3.7	3.15	0.1	0.09	0.101[j]
Urine albumin g/mmol (mean, sd) (urinePCl)		0.9	0.68	1.1	0.96	0.715[k]
Albumin g/L (mean, sd)		22.3	10.65	21.1	10.18	0.532[l]
Histology Tubulointerstitial disease	Yes	3	2.9	0	0.0	0.261[m]
	No	102	97.1	79	100.0	

[a, c, j, k, l] *Performed Wilcoxon Rank Sum test*
[b, d, f, h] *Performed Chi-square test*
[e, g, i, m] *Performed Fisher's exact test*

4.10.2: Patient survival in focal segmental glomerulosclerosis and minimal change disease

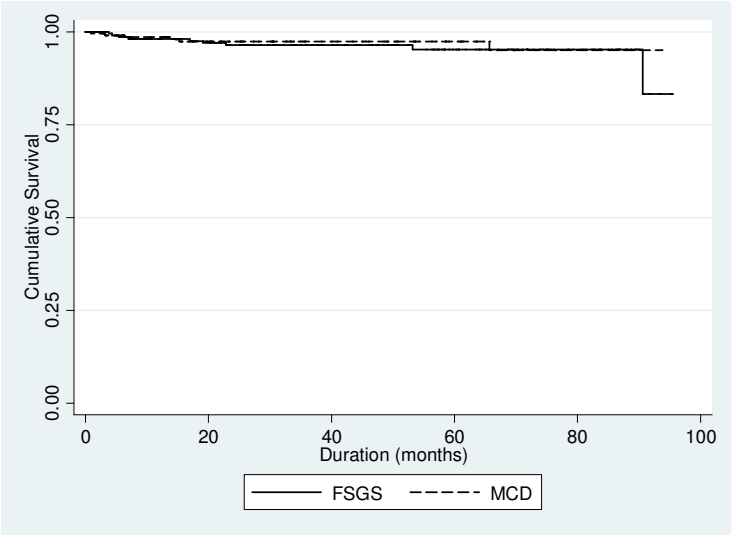
Table and Figure 4.10.2 shows that patient survival was similar for both MCD and FSGS; 96-97% at 3 years and 95% at 5 years from the time of renal biopsy.

Table 4.10.2: Patient survival for focal segmental glomerulosclerosis and minimal change disease, 2005-2012

Interval (months)	Minimal Change Disease			Focal Segmental Glomerulosclerosis		
	n	% survival	SE	n	% survival	SE
0	216	100	-	239	100	-
12	185	99	0.008	183	98	0.009
24	136	97	0.012	156	96	0.013
36	100	97	0.012	126	96	0.013
48	79	97	0.012	97	96	0.013
60	54	97	0.012	68	95	0.018
72	22	95	0.025	44	95	0.018
84	9	95	0.025	21	95	0.018

**Missing of 6 censored cases where the outcome date < date of first biopsy*
***Missing of 3 censored cases where the outcome date < date of 1st biopsy*
Event = death; Status as at 31 Dec 2012 or last follow-up

Figure 4.10.2: Patient survival by focal segmental glomerulosclerosis and minimal change disease



4.10.3: Renal survival of patient with focal segmental glomerulosclerosis and minimal change disease

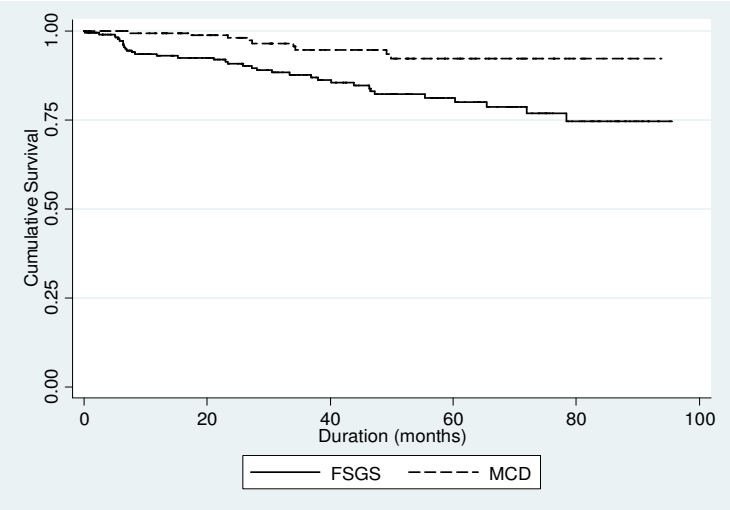
The renal survival data was extracted from the Malaysia Dialysis Transplant registry. Table and Figure 4.10.3 showFSGS has pooer renal survival; 88% and 80% at 3 years and 5 years respectively. Renal survival for MCD at 3 years and 5 years was 95% and 92% respectively.

Table 4.10.3: Death-censored renal survival of patient with focal segmental glomerulosclerosis and minimal change disease, 2005-2012

Interval (months)	Minimal Change Disease			Focal Segmental Glomerulosclerosis		
	n	% survival	SE	n	% survival	SE
0	216	100	-	239	100	-
12	185	99	0.005	183	93	0.017
24	136	98	0.011	156	91	0.020
36	100	95	0.020	126	88	0.024
48	79	95	0.020	97	82	0.030
60	54	92	0.026	68	80	0.033
72	22	92	0.026	44	77	0.039
84	9	92	0.026	21	75	0.044

**Missing of 6 censored cases where the outcome date < date of 1st biopsy*
***Missing of 1 case and 2 censored cases where the outcome date < date of 1st biopsy*
Event = ESRF; Status as at 31 Dec 2012 or died or last follow-up

Figure 4.10.3: Renal survival by focal segmental glomerulosclerosis and minimal change disease, 2005-2012



4.11: Paediatric Lupus Nephritis (n=277)

4.11.1: Total number of patients and renal biopsies

There were 277 renal biopsies performed for 248 children with lupus. (Table 4.11.1)

4.11.2: Number of renal biopsy done on each individual patient with lupus

Majority of children with lupus underwent first kidney biopsy 84.5%, however 15.5% of them had repeat biopsies. (Table 4.11.2)

Table 4.11.1: Total number of patients and biopsies (SLE)

Year	Total number of patients	Total number of biopsies
2005 -2010	186	213
2011	30	31
2012	32	33
All	**248**	**277**

Table 4.11.2: Distribution of renal biopsy in patient with lupus by number of episodes, 2005-2012

Total number of biopsy /patient	n	%
1st episode	234	84.5
2nd	36	13.0
3rd	7	2.5
Total Patient	**277**	**100**

4.11.3: Patient characteristics of paediatric lupus nephritis

The female:male ratio was 5.2:1 reflecting the preponderance of lupus in girls. The racial distribution for paediatric lupus nephritis was Malay (62.5%), Chinese (25.4%), Indian (2.8%) and others (9.3%). The mean age of children with lupus nephritis at the time of biopsy was 11.9 ± 2.9 years. (Table 4.11.3.1, Table 4.11.3.2 & Table 4.11.3.3). At the rime of biopsy, 6.9% of the patients needed dialysis therapy and 41.2% has hypertension. (Table 4.11.3.4 & Table 4.11.5). The frequent clinical presentation at biopsy was urinary abnormalities (32.1%) and nephrotic syndrome (30.3%) . (Table 4.11.3.6)

Table 4.11.3.1: Gender distribution for paediatric lupus nephritis, 2005-2012

Gender	n	%
Male	40	16.1
Female	208	83.9
Total	**248**	**100**

Table 4.11.3.2: Ethnic distribution for paediatric lupus nephritis, 2005-2012

Ethnic	n	%
Malay	155	62.5
Chinese	63	25.4
Indian	7	2.8
Others*	23	9.3
Total	**248**	**100**

*** by patient count, **SLE** race*

** inclusive of 2 foreigners*

Table 4.11.3.3: Age distribution for paediatric lupus nephritis, 2005-2012

Age (years)	2005 - 2010	2011	2012	All
n	213	31	33	277
Mean	11.85	12.08	11.53	11.84
Standard deviation	2.733	3.667	3.878	2.993
Minimum	0.25	0.23	0.27	0.23
Maximum	15.00	14.98	14.97	15.00

*** by biopsy count, age at biopsy, SLE*

Table 4.11.3.4: Dialysis therapy for paediatric lupus nephritis at the time of biopsy, 2005-2012

Needed dialysis therapy	n	%
Yes	19	6.9
No	215	77.6
Missing/Not available	43	15.5
Total	**277**	**100.0**

Table 4.11.3.5: Patient with hypertension (SLE), 2005-2012

Hypertension	n	%
Yes	114	41.2
No	150	54.2
Missing/Not available	13	4.7
Total	**277**	**100**

Table 4.11.3.6: Clinical presentation at biopsy (SLE), 2005-2012

Clinical presentation	n	%
Urine abnormalities	89	32.1
Nephritic syndrome	35	12.6
Nephrotic syndrome	84	30.3
Nephritic nephrotic syndrome	42	15.2
Unknown	21	7.6
Missing	6	2.2
Total	**277**	**100.0**

4.11.4: Extra renal manifestation of paediatric SLE

The most common extra renal manifestation among 277 children were cutaneous involvement. (Malar rash 44.8%, photosensitivity 23.1%, oral ulcer 28.2% and discoid rash 6.5%).This was followed by haematological involvement 58.8%, joint involvement 32.5%, serositis in 15.2% and cerebral involvement 11.6%. (Table 4.11.4(a)) There were 206 cases (74.4%) fulfilled 4 or more ARA criteria at presentation. (Table 4.11.4(b))

Table 4.11.4(a): Clinical presentation of paediatric lupus, 2005-2012

Clinical presentation	n	%
Total number of patient	277	-
Malar rash	124	44.8
Discoid rash	18	6.5
Photosensitivity	64	23.1
Oral ulcers	78	28.2
Arthritis	90	32.5
Serositis	42	15.2
Renal	229	82.7
Cerebral	32	11.6
Hematological	163	58.8

Table 4.11.4(b): ARA criteria at presentation, 2005-2012

Number of ARA criteria	n	%
<4	71	25.6
≥ 4	206	74.4
Total	**277**	**100**

4.11.5: Classification of paediatric lupus nephritis

All renal biopsies were reviewed and classified according to WHO or ISN/RPS Classification. For patient who did not require dialysis therapy, Class IV or V+IV lupus nephritis was found in 62.8% of patients. Less frequent findings were class III or V+III (8.8%) lupus nephritis. Whereas for those who needed dialysis therapy the predominant histology class was class IV or V+IV (57.9%). In 10-15% of biopsies the histology findings were class II, Class III or V+III and classs VI. (Table 4.11.5)

Table 4.11.5: Classification of paediatric lupus nephritis, 2005-2012

	Needed dialysis therapy		Not needed dialysis therapy	
WHO/ISN /RPS Class	**n**	**%**	**n**	**%**
Class I	0	0.0	2	0.9
Class II	2	10.5	19	8.8
Class III or V+III	3	15.8	49	22.8
Class IV or V+IV	11	57.9	135	62.8
Class V or V+II	1	5.3	9	4.2
Class VI	2	10.5	0	0.0
Unknown	0	0.0	1	0.5
Total	**19**	**100**	**215**	**100**

4.11.6: Patient survival in lupus nephritis

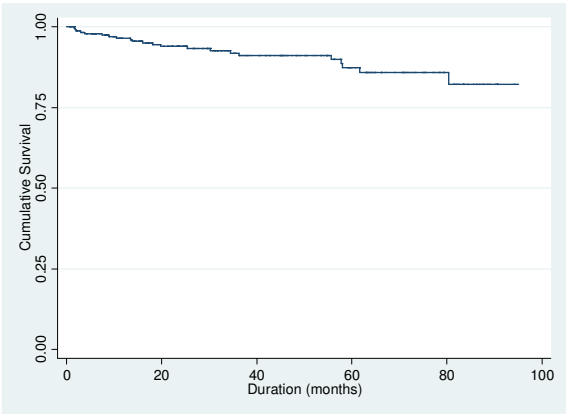
Table and Figure 4.11.6 showed that patient survival was 91% at 3 years and 87% at 5 years from the time of renal biopsy.

Table 4.11.6: Patients survival in lupus nephritis, 2005-2012

Interval (months)	Lupus Nephritis patients		
	n	**% survival**	**SE**
0	246	100	-
12	199	97	0.012
24	160	94	0.016
36	120	91	0.021
48	95	91	0.021
60	64	87	0.029
72	37	86	0.032
84	15	82	0.048

**Missing of 2 censored cases where the outcome date < date of 1st biopsy*
Event = death; Status as at 31st Dec 2012 or last follow-up

Figure 4.11.6: Patient survival in lupus nephritis



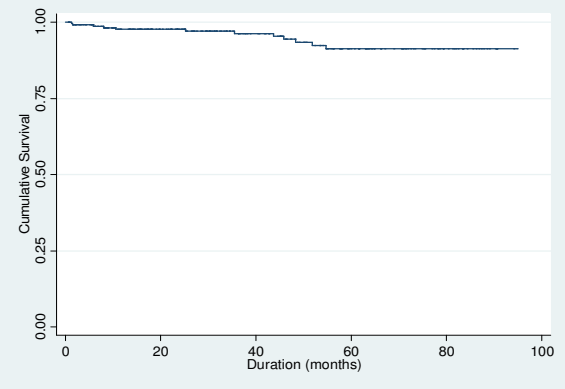
4.11.7: Renal survival of patient with lupus nephritis

Table and Figure 4.11.7 showed that renal survival was 96% at 3 years and 91% at 5 years from the time of renal biopsy.

Table 4.11.7: Death-censored Renal survival of patient with lupus nephritis, 2005-2012

Interval (months)	Lupus Nephritis patients		
	n	**% survival**	**SE**
0	246	100	-
12	199	97	0.012
24	160	94	0.016
36	120	91	0.021
48	95	91	0.021
60	64	87	0.029
72	37	86	0.032
84	15	82	0.048

Figure 4.11.7 : Death-censored renal survival in lupus nephritis, 2005-2012



**Missing of 1 case and 1 censored case where the outcome date < date of 1st biopsy*
Event = ESRF; Status as at 31st Dec 2012 or died or last follow-up

4.12: Renal outcome

Of the 1113 patients biopsied, 116 children were reported to the Malaysian Dialysis and Transplant Registry with end stage renal disease. FSGS is the most common cause of end stage renal disease accounting for 31.9%. This was followed by advanced glomeruloslcerosis (18.1%), lupus nephritis (11.2%) and IgA nephropathy (9.5%). Nine patients (7.8%) with minimal change progressed to end stage renal disease. (Table 4.12)

Table 4.12: Causes of end stage renal disease in children who underwent renal biopsy, 2005-2012

Causes	n	%
FSGS	37	31.9
Advance gloemrulosclerosis (advance GN)	21	18.1
Lupus nephritis	13	11.2
IgA nephropathy	11	9.5
MCD	9	7.8
Post-infectious GN	4	3.4
Chronic interstitial nephritis	4	3.4
Idiopathic crescentic GN	4	3.4
Mesangial proliferative GN non-IgA	3	2.6
Membranous nephropathy	3	2.6
Henoch Schonlein Purpura	3	2.6
Systemic vasculitis	2	1.7
Membranoproliferative GN	1	0.9
Acute tubular necrosis	1	0.9
HUS/TTP	-	-
Acute interstitial nephritis	-	-
Total	**116**	**100**

** by patient count*

4.13: Biopsy failure and complication

4.13.1: Risk factors for biopsy failure

As shown in table 4.13.1, complications were reported in 3.6% of biopsy. The common complications were bleeding 88.6% and perinephric haematoma 15.9%. Blood transfusion was needed in 12 patients. There was two reported case of arteriovenous fistula post biopsy. (Table 4.13.1)

Table 4.13.1: Frequency of complication, 2005-2012

		n	%
Total number of biopsies		1,224	-
Total number of complication		44	3.6
Type of complication	Bleeding	39	88.6
	- Gross haematuria	36	81.8
	- Haematoma	2	4.5
	Perirenal collection	7	15.9
	Infection	0	0.0
	Arteriovenous malformation	2	4.5
	Hypotension	1	2.3
	Others	0	0.0

4.13.2: Risk factors for complication

The risk of complication post renal biopsy was higher in those younger than 2 years old, low GFR <15 ml/ min/1.73m², needed dialysis therapy and low hemoglobin level ≤8g/dL. Lupus nephritis was not found to have significant impact on complication rate. (Table 4.13.2)

Table 4.13.2: Risk factors for complication, 2005-2012

Factors		n	Number of complication	Odds ratio	95% CI	*p*-value
Age (years)	<2	48	6	4.71	1.76, 12.63	0.002
	>2-≤5	152	6	1.53	0.60, 3.91	0.372
	>5-≤10	326	11	1.07	0.51, 2.27	0.851
	>10 (ref*)	698	21	1.00	-	-
Renal failure	needed dialysis	101	9	2.72	1.24, 5.97	0.012
	not needed dialysis (ref*)	959	31	1.00	-	-
	Unknown	164	4	-	-	-
Calculated GFR ml/min/1.73m²	<15	65	9	4.32	1.82, 10.23	0.001
	15-<30	69	3	1.28	0.36, 4.52	0.699
	30-<60	125	8	1.90	0.80, 4.51	0.148
	60- <90	165	6	1.08	0.42, 2.80	0.870
	≥ 90	554	18	1.00	-	-
	unknown	246	0	-	-	-
Hemoglobin (Hb) level g/dl	≤8	28	3	3.49	0.97, 12.58	0.056
	>8-≤10	201	8	1.18	0.53, 2.62	0.684
	≥11 (ref*)	927	32	1.00	-	-
	Unknown	68	1	-	-	-
Ultrasound – guidance	Not realtime	356	16	0.61	0.33, 1.15	0.128
	Realtime (ref*)	396	28	1.00	-	-
	Unknown	472	0	-	-	-
Plug biopsy **	Yes	6	0	-	-	-
	Not (ref*)	704	41	-	-	-
	Unknown	514	3	-	-	-
SLE status	SLE	288	5	0.44	0.17, 1.13	0.087
	Non SLE (ref*)	936	39	1.00	-	-
Needle size	14G	117	7	0.78	0.34, 1.79	0.552
	16G (ref*)	480	36	1.00	-	-
	18G	214	1	0.06	0.01, 0.42	0.005
	Unknown	413	0	-	-	-
Number of passes	≤2	480	25	0.81	0.44, 1.51	0.512
	3-≤4 (ref*)	300	19	1.00	-	-
	≥ 5**	19	0	-	-	-
	Unknown	425	0	-	-	-

(ref) Reference category*
CI-confidence interval
*** Not able to do compute due to the small sample size*
Unknown = No information

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