CHAPTER 5

PAEDIATRIC RENAL REPLACEMENT THERAPY

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SECTION A: RRT PROVISION FOR PAEDIATRIC PATIENTS

This chapter presents data on paediatric patients less than 20 years of age receiving renal replacement therapy (RRT) from 2001 to 2010.

The dialysis acceptance rate for the paediatric population had increased to 10 per million age related population (pmarp) in 2009 and 8 pmarp in 2010 (data for 2010 however is preliminary as at the time of writing this report there might still be some new patients yet to be notified to the registry).

There has been a drop in the number of new transplant done in 2010 after an initial encouraging increase over the last 5 years with about 20 new transplants yearly. The overall incidence rate for all RRT was 10 pmarp in 2009 and 8 pmarp in 2010.

As expected, with increasing number of children on dialysis and improve survival; the number of prevalent patients continue to rise. At the end of 2010, 823 paediatric patients were receiving RRT in Malaysia. Of these, 633 children were on dialysis. The equivalent dialysis prevalence rate more than doubled over the last 10 years from 35 pmarp in 2001 to 78 pmarp in 2010 The prevalent HD population continued to expand at a higher rate than the PD population although the dialysis acceptance rate for new PD patients was higher, consistent with higher technique failure among PD patients.

Table 5.1: Stock and Flow of Paediatric Renal Replacement Therapy 2001-2010

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
New HD patients	24	29	32	39	35	51	35	44	33	35
New PD patients	40	54	38	41	47	44	50	50	69	50
New Transplants	11	12	11	11	18	23	20	21	19	8
HD deaths	1	11	6	10	9	7	11	11	13	15
PD deaths	8	8	12	6	9	17	8	11	11	16
Transplant deaths	0	1	2	0	1	1	3	4	2	2
On HD at 31st December	143	160	183	216	242	287	313	351	366	389
On PD at 31st December	123	152	164	176	193	189	202	208	239	244
Functioning transplant at 31st December	102	112	117	126	140	157	168	175	182	190

Figure 5.1 (a): Incident cases of RRT by modality in children under 20 years old, 2001-2010

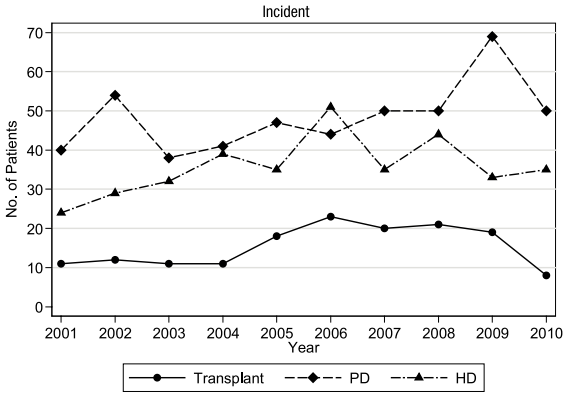


Figure 5.1 (b): Prevalent cases of RRT by modality in children under 20 years old, 2001-2010

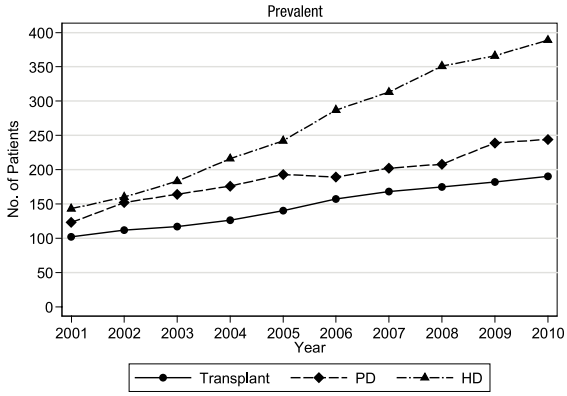
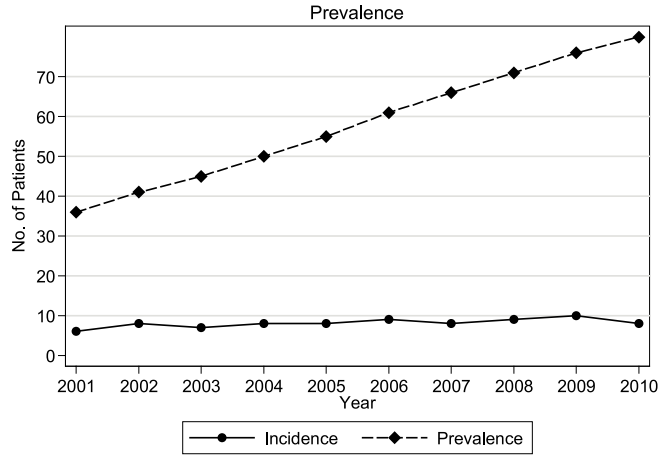


Table 5.2: Paediatric Dialysis and Transplant Rates per million age-group population 2001-2010

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Incidence Rate										
New HD	2	3	3	4	3	5	3	4	3	3
New PD	4	5	4	4	5	4	5	5	7	5
New Transplant	1	1	1	1	2	2	2	2	2	1
All RRT	6	8	7	8	8	9	8	9	10	8
Prevalence Rate at 31st December										
On HD	14	15	18	21	23	28	30	34	35	38
On PD	12	15	16	17	19	18	19	20	23	24
Functioning Graft	10	11	11	12	13	15	16	17	18	18
All RRT	35	40	44	49	54	60	64	70	75	78

Figure 5.2: Incidence and prevalence rate per million age related population years old on RRT, 2001-2010



SECTION B: DISTRIBUTION OF PAEDIATRIC DIALYSIS PATIENTS

The treatment gap between the more economically developed states of West Malaysia and East Malaysia had become less obvious over the years with the set up of new paediatric and adult nephrology centres in these regions particularly in East Malaysia where the number of new dialysis patients had doubled over the last 5 years.

Table 5.3 (a): Dialysis Treatment Rate by State, per million state age group populations; 2001-2010

State	2001-2005	2006-2010
Pulau Pinang	11	14
Melaka	13	9
Johor	9	10
Perak	7	8
Selangor & Putrajaya	6	9
Kuala Lumpur	7	13
Negeri Sembilan	10	6
Kedah	8	6
Perlis	10	9
Terengganu	8	11
Pahang	6	10
Kelantan	7	6
Sarawak	6	8
Sabah & WP Labuan	4	7

Table 5.3 (b): New Dialysis Patients by State, 2001-2010

State	2001-2005	2006-2010
Pulau Pinang	29	36
Melaka	19	14
Johor	52	59
Perak	35	38
Selangor & Putrajaya	53	82
Kuala Lumpur	20	36
Negeri Sembilan	19	11
Kedah	31	25
Perlis	5	4
Terengganu	19	24
Pahang	19	27
Kelantan	26	25
Sarawak	30	37
Sabah & WP Labuan	21	42

There had been consistently more males compared to females among the population of children on dialysis and transplant. This trend had persisted over the last 10 years; probably a reflection of the higher incidence of ESRD among the males. However this gender disparity appears to be less marked in the recent years perhaps reflecting a gender bias in the early years.

Table 5.4: Number of New Dialysis and Transplant Patients by Gender 2001-2010

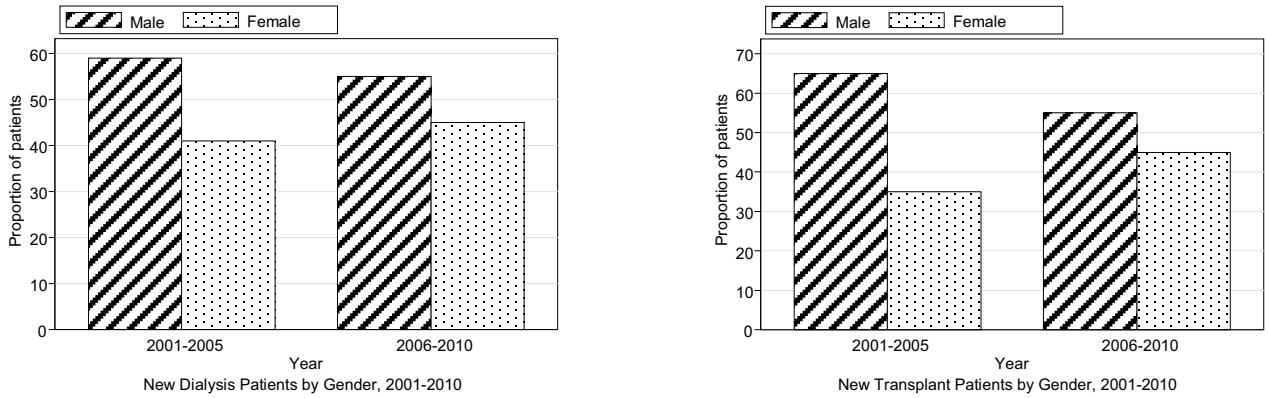
a) New Dialysis

Year	Male		Female	
	n	%	n	%
2001-2005	224	59	155	41
2006-2010	254	55	207	45

b) New Transplant

Year	Male		Female	
	n	%	n	%
2001-2005	41	65	22	35
2006-2010	50	55	41	45

Figure 5.4: Number of New Dialysis and Transplant Patients by gender 2001-2010

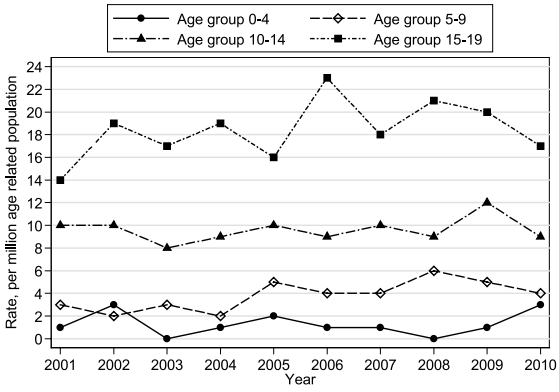


The dialysis treatment rate had leveled off over the last 10 years across the paediatric age spectrum. The treatment rate had remained consistently higher among the older age groups while the number of 0-4 year olds provided chronic dialysis treatment remained very low.

Table 5.5: New RRT Rate, Per Million Age Related Population by Age Group 2001-2010

Year	New RRT rate, pmp			
	Age group (years)			
	0-4	5-9	10-14	15-19
2001	1	3	10	14
2002	3	2	10	19
2003	0	3	8	17
2004	1	2	9	19
2005	2	5	10	16
2006	1	4	9	23
2007	1	4	10	18
2008	0	6	9	21
2009	1	5	12	20
2010	3	4	9	17

Figure 5.5: New RRT Rate by Age group 2001-2010

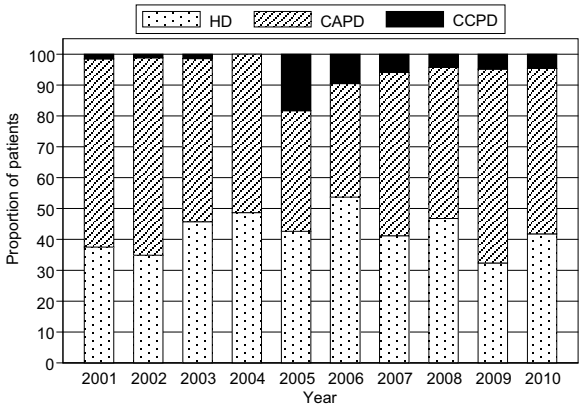


PD was the first modality of dialysis in about two thirds of patients. A significant proportion of children were previously started on automated PD (CCPD) as the first mode of dialysis in 2005 when CCPD was first made widely available to the paediatric population. However since 2009 the policy had changed back to CAPD first and the numbers on CCPD as expected showed a decreasing trend

Table 5.6: New Dialysis by treatment modality 2001-2010

Year	HD		CAPD		CCPD	
	n	%	n	%	n	%
2001	24	38	39	61	1	2
2002	29	35	53	64	1	1
2003	32	46	37	53	1	1
2004	39	49	41	51	0	0
2005	35	43	32	39	15	18
2006	51	54	35	37	9	9
2007	35	41	45	53	5	6
2008	44	47	46	49	4	4
2009	33	32	64	63	5	5
2010	35	41	46	54	4	5

Figure 5.6: New Dialysis by treatment modality 2001-2010

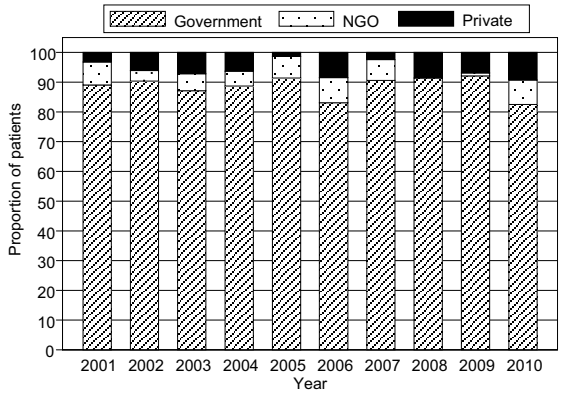


Most of the children received their dialysis treatment from government centres and hence were government funded.

Table 5.7: New Dialysis by sector 2001-2010

Year	Government		NGO		Private	
	n	%	n	%	n	%
2001	57	89	5	8	2	3
2002	75	90	3	4	5	6
2003	61	87	4	6	5	7
2004	71	89	4	5	5	6
2005	75	91	6	7	1	1
2006	79	83	8	8	8	8
2007	77	91	6	7	2	2
2008	86	91	0	0	8	9
2009	94	92	1	1	7	7
2010	71	84	6	7	8	9

Figure 5.7: New Dialysis by sector 2001-2010



SECTION C: PRIMARY RENAL DISEASE

The most common primary renal disease identified was glomerulonephritis, which accounted for about 23% of the patients. FSGS on its own accounted for almost 8% of the ESRD population. SLE was the second commonest known cause ESRD in girls. The number of children presenting with ESRD of unknown aetiology was still high at 35%.

Table 5.8: Primary renal disease by sex, 2001-2010

Primary Renal Disease	Male		Female		All	
	n	%	n	%	n	%
Glomerulonephritis	106	25	66	20	172	23
FSGS	30	7	27	8	57	8
Refux nephropathy	25	6	7	2	32	4
SLE	10	2	40	12	50	7
Obstructive uropathy	35	8	17	5	52	7
Renal dysplasia	18	4	10	3	28	4
Hereditary nephritis	14	3	3	1	17	2
Cystic kidney disease	3	1	5	2	8	1
Metabolic	4	1	3	1	7	1
Others	28	7	39	12	67	9
Unknown	156	36	112	34	268	35

SECTION D: TYPES OF RENAL TRANSPLANTATION

Living related renal transplant used to be the commonest type of transplantation done among children. However the trend has changed particularly over the last 5 years in that cadaveric renal transplant is now the most common transplantation done accounting for about 55% compared to 27% for living related renal transplant. About 16% of renal transplant were done overseas mainly from commercial cadaveric programme.

Table 5.9: Types of Renal Transplantation, 2001-2010

Year	2001-2005		2006-2010	
	n	%	n	%
Commercial cadaver	17	27	14	16
Commercial living donor	3	5	1	1
Living related donor	26	42	24	27
Cadaver	16	26	50	55
Living emotionally related	0	0	1	1
TOTAL	62	100	90	100

SECTION E: SURVIVAL ANALYSIS

Renal transplantation had the best patient survival with 94% survival at 5 years and 89% at 10 years. HD patients consistently showed better survival compared to PD patients and this disparity becomes more marked when censored for change of dialysis modality. The separation of the survival curve became more obvious after about 4 to 5 years of dialysis with PD patients showing a poorer outcome compared to HD (Figure 6.10b)

Table 5.10 (a): Patient survival by dialysis modality analysis (not censored with change of modality)

Modality Interval (months)	Transplant			PD			HD		
	n	% survival	SE	n	% survival	SE	n	% survival	SE
0	242	100	-	662	100	-	501	100	-
6	234	99	1	614	97	1	460	97	1
12	230	98	1	571	94	1	436	95	1
24	207	97	1	471	88	1	387	91	1
36	186	96	1	408	84	2	337	88	2
48	165	95	1	355	82	2	295	86	2
60	143	94	2	308	79	2	252	85	2
72	125	93	2	265	76	2	221	83	2
84	117	93	2	224	72	2	184	81	2
96	109	93	2	196	70	2	157	80	2
108	99	92	2	150	68	2	135	78	2
120	90	89	3	117	65	3	119	78	2

Figure 5.10 (a): Patient survival by dialysis modality analysis (not censored with change of modality)

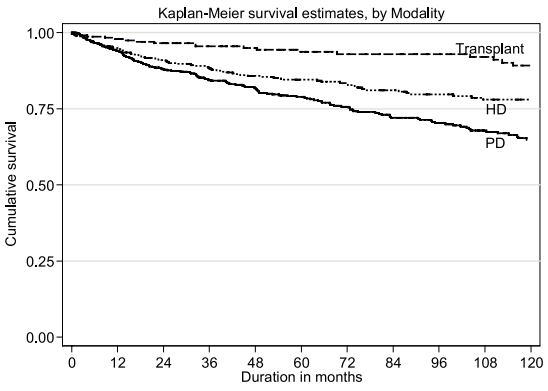


Figure 5.10 (b): Patient survival by dialysis modality analysis (censored with change of modality)

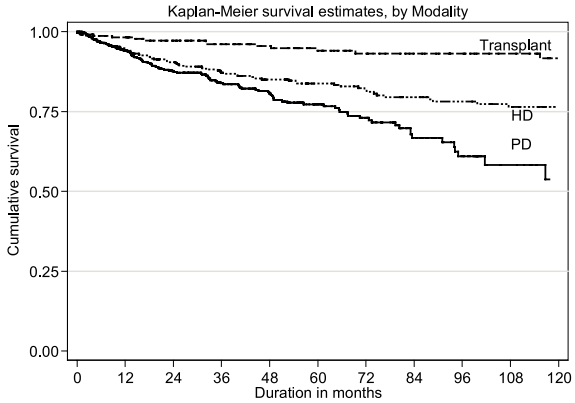


Table 5.10 (b): Patient survival by dialysis modality analysis (censored with change of modality)

Modality Interval (months)	Transplant			PD			HD		
	n	% survival	SE	n	% survival	SE	n	% survival	SE
0	242	100	-	662	100	-	501	100	-
6	217	99	1	600	97	1	440	96	1
12	213	98	1	522	94	1	392	95	1
24	188	97	1	370	88	1	321	90	1
36	166	96	1	266	84	2	268	87	2
48	141	95	1	203	81	2	225	85	2
60	120	94	2	145	77	2	183	84	2
72	103	93	2	107	73	3	155	82	2
84	89	93	2	64	67	3	123	80	2
96	79	93	2	40	61	4	101	78	3
108	69	93	2	20	58	5	85	76	3
120	61	92	2	12	54	6	71	76	3

After the first year; dialysis technique failure rate was much higher amongst PD patients with progressive widening of the technique survival curve with increasing years on dialysis. Technique survival at 5 years was only 50% for PD compared to 78% for HD.

Table 5.11: Dialysis Technique Survival by Modality, 2001-2010

Modality	PD			HD		
Interval (months)	n	% survival	SE	n	% survival	SE
0	704	100		662	100	
6	638	95	1	580	94	1
12	558	89	1	510	91	1
24	396	78	2	407	84	2
36	283	66	2	334	82	2
48	215	59	2	277	79	2
60	153	49	2	220	78	2
72	114	41	3	188	75	2
84	69	31	3	144	72	2
96	44	23	3	117	70	2
108	23	19	3	95	69	3
120	14	16	3	75	68	3

Figure 5.11: Dialysis Technique Survival by Modality, 2001-2010

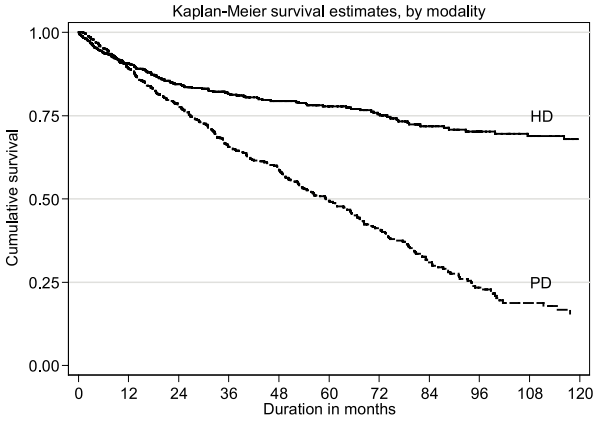
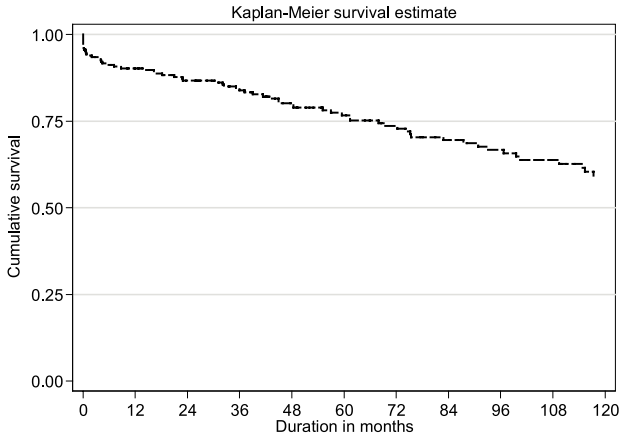


Figure 5.12: Transplant Graft Survival, 2001-2010



The graft survival for paediatric transplants was 90% at 1 year and 77% at 5 years and 59% at 10 years.

Table 5.12: Transplant Graft Survival, 2001-2010

Interval (month)	n	% survival	SE
0	239	100	
6	202	91	2
12	192	90	2
24	168	87	2
36	146	84	3
48	122	80	3
60	105	77	3
72	93	74	3
84	81	70	4
96	69	67	4
108	62	64	4
120	52	59	4