CHAPTER 6

Paediatric Renal Replacement Therapy

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SECTION A: RRT PROVISION FOR PAEDIATRIC PATIENTS

This chapter presents data from all patients less than 20 years of age receiving renal replacement therapy (RRT) from 1999 to 2008. The dialysis acceptance rate for the paediatric population in 2008 was 7 per million age related population (pmarp). The dialysis acceptance rate had remained fairly stable over the last 7 years suggesting that probably almost all children with ESRD in Malaysia had access to treatment. The number of new transplants had earlier shown an encouraging increase but has also remained quite stable over the last 4 years with about 20 new transplants yearly. The overall incident rate for all RRT was 8 pmarp in 2008.

As expected the number of prevalent patients continued to rise. At the end of 2008, 778 paediatric patients were receiving RRT in Malaysia. Of these, 555 children were on dialysis. The equivalent dialysis prevalence rate more than doubled over the last 10 years from 20 pmarp in 1999 to 48 pmarp in 2008. The prevalent HD population continued to expand at a higher rate than the PD population although the incident rate for PD is higher consistent with higher technique failure with PD.

Table 6.1: Stock and Flow of Paediatric Renal Replacement Therapy 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New HD patients	23	12	24	28	33	39	34	51	35	39
New PD patients	30	37	40	54	38	41	47	44	49	46
New Transplants	15	18	11	13	11	11	17	22	20	20
HD deaths	2	4	1	11	6	10	9	7	10	10
PD deaths	2	3	8	8	9	5	9	16	8	8
Transplant deaths	0	1	0	1	2	1	1	3	3	4
On HD at 31st Dec	106	120	144	161	185	218	242	288	316	347
On PD at 31st Dec	92	109	123	152	163	176	192	189	201	208
Functioning transplant at 31st Dec	80	93	101	112	118	126	140	155	166	173

Figure 6.1 (a): Incidence cases of RRT by modality in children under 20 years old, 1999-2008

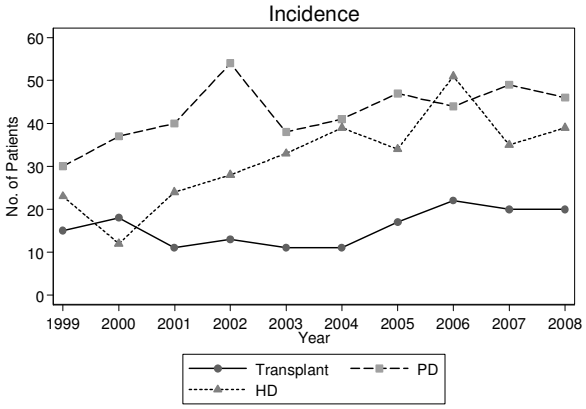


Figure 6.1 (b): Prevalence cases of RRT by modality in children under 20 years old, 1999-2008

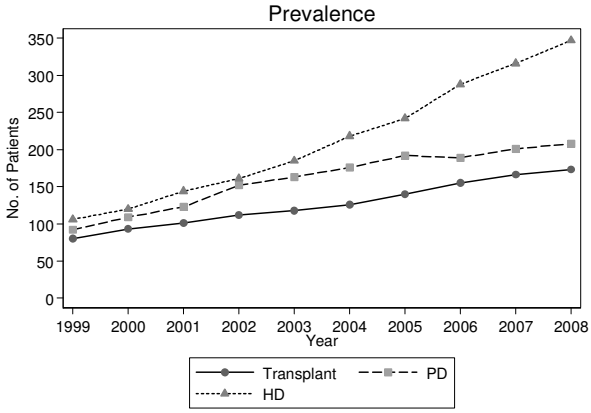
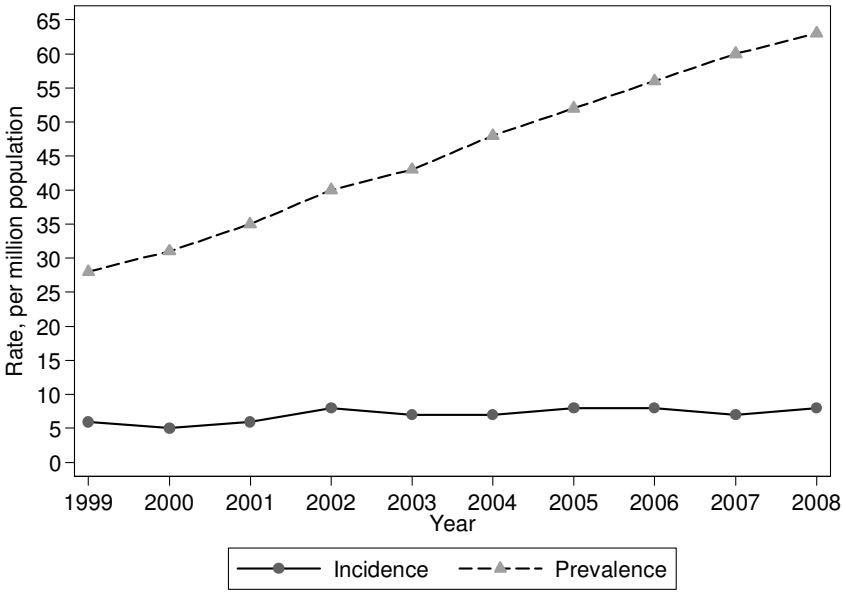


Table 6.2: Paediatric Dialysis and Transplant Rates per million age-group population 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence Rate										
New HD	2	1	2	3	3	4	3	5	3	3
New PD	3	4	4	5	4	4	4	4	4	4
New Transplant	2	2	1	1	1	1	2	2	2	2
All RRT	6	5	6	8	7	7	8	8	7	8
Prevalence Rate at 31st December										
On HD	11	12	14	15	17	20	22	26	28	30
On PD	9	11	12	14	15	16	17	17	18	18
Functioning Graft	8	9	10	11	11	12	13	14	15	15
All RRT	28	31	35	39	42	47	51	55	59	63

Figure 6.2: Incidence and prevalence rate per million age related population on RRT, 1999-2008



SECTION B: DISTRIBUTION OF PAEDIATRIC DIALYSIS PATIENTS

The treatment rate is still consistently higher for states in the west coast of West Malaysia which are deemed to be more economically advantaged compared to the east coast of West Malaysia and in East Malaysia. However this gap is becoming less obvious over the years with the set up of new paediatric nephrology centres in these regions.

Table 6.3 (a): Dialysis Treatment Rate by State, per million state age group populations, 1999-2007

State	1999-2003	2004-2008
Pulau Pinang	9	16
Melaka	7	15
Johor	10	10
Perak	6	10
Selangor & Putrajaya	8	7
Kuala Lumpur	11	12
Negeri Sembilan	8	13
Kedah	10	7
Perlis	16	10
Terengganu	10	10
Pahang	7	11
Kelantan	6	8
Sarawak	4	8
Sabah & WP Labuan	3	7

Table 6.3 (b): New Dialysis Patients by State, 1999-2008

State	1999-2003	2004-2008
Pulau Pinang	22	43
Melaka	10	23
Johor	58	67
Perak	26	46
Selangor & Putrajaya	68	70
Kuala Lumpur	30	35
Negeri Sembilan	15	25
Kedah	37	27
Perlis	8	5
Terengganu	23	24
Pahang	20	33
Kelantan	23	31
Sarawak	17	40
Sabah & WP Labuan	21	47

There has been consistently more males compared to females among the population of children on dialysis and this trend has persisted over the last 10 years. This is probably a reflection of the higher incidence of ESRD among the males. However this gender disparity appears more marked among the transplanted patients.

Table 6.4: Number of New Dialysis and Transplant Patients by Gender, 1999-2008

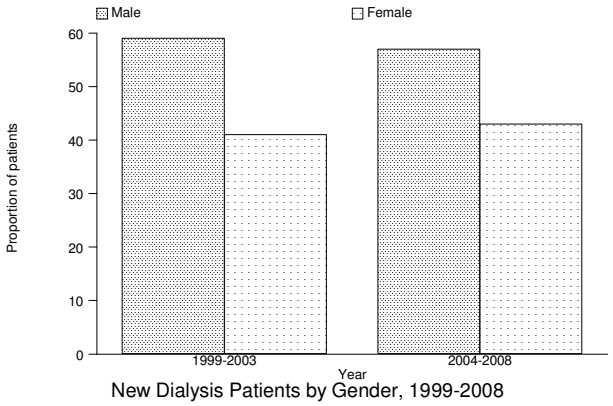
a) New Dialysis

Year	Male		Female	
	No.	%	No.	%
1999-2003	188	59	131	41
2004-2008	242	57	183	43

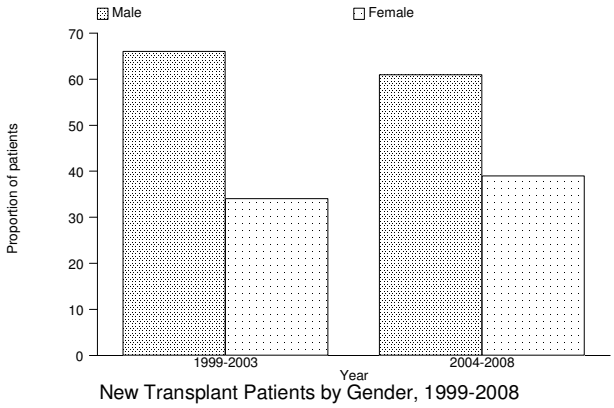
b) New Transplant

Year	Male		Female	
	No.	%	No.	%
1999-2003	45	66	23	34
2004-2008	55	61	35	39

Figure 6.4: Number of New Dialysis and Transplant Patients by gender, 1998-2007



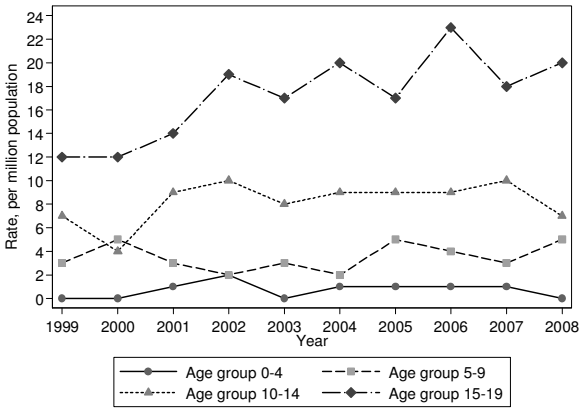
New Dialysis Patients by Gender, 1999-2008



New Transplant Patients by Gender, 1999-2008

The dialysis treatment rate had leveled off over the last 5 years across the paediatric age spectrum. The treatment rate had remained consistently higher among the older age groups. The number of 0-4 year olds provided chronic dialysis treatment remained abysmally low.

Figure 6.5: New RRT Rate by Age group, 1999-2008

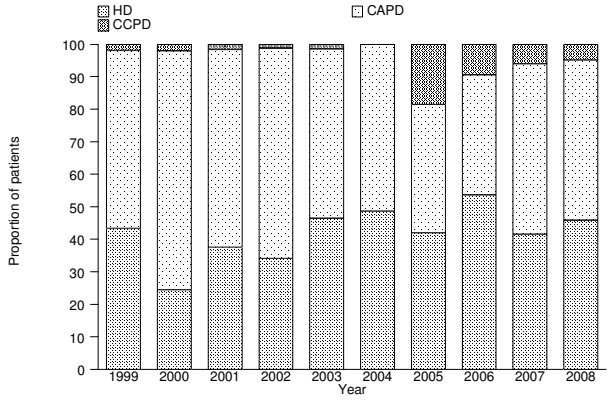


PD was the first modality of dialysis in 54% of patients. In the last 4 years a significant proportion of children on PD were started on automated PD (CCPD) as the first mode of dialysis; the highest number was in 2005 when APD was first made widely available to the paediatric population.

Table 6.6: New Dialysis treatment by dialysis modality, 1999-2008

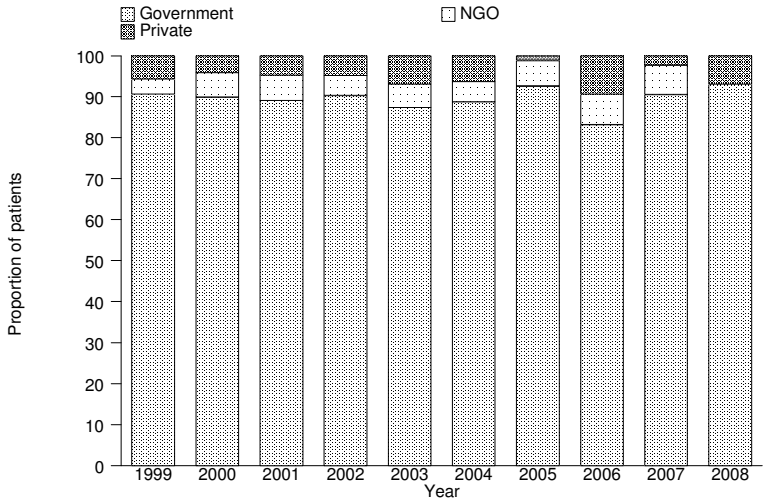
Year	HD		CAPD		CCPD	
	No.	%	No.	%	No.	%
1999	23	43	29	55	1	2
2000	12	24	36	73	1	2
2001	24	38	39	61	1	2
2002	28	34	53	65	1	1
2003	33	46	37	52	1	1
2004	39	49	41	51	0	0
2005	34	42	32	40	15	19
2006	51	54	35	37	9	9
2007	35	42	44	52	5	6
2008	39	46	42	49	4	5

Figure 6.6: New Dialysis by treatment modality, 1999-2008



Most of the children (up to 90%) received their dialysis treatment from government centres and hence were government funded. This figure had not changed over the last 10 years.

Figure 6.7: New Dialysis by sector ,1999-2008



SECTION C: PRIMARY RENAL DISEASE

The most common primary renal disease identified was glomerulonephritis, which affected 30% of the patients. FSGS on its own accounted for 8% of the ESRD population. The number of children presenting with ESRD of unknown aetiology was still high at 48%.

Table 6.8: Primary renal disease by sex, 1999-2008

Primary Renal Disease	Male		Female		All	
	No.	%	No.	%	No.	%
Glomerulonephritis	130	22	91	21	221	22
FSGS	46	8	30	7	76	8
Refux nephropathy	30	5	13	3	43	4
SLE	16	3	46	11	62	6
Obstructive uropathy	41	7	9	2	50	5
Renal dysplasia	15	3	9	2	24	2
Hereditary nephritis	11	2	11	3	22	2
Cystic kidney disease	13	2	3	1	16	2
Drug induced nephropathy	6	1	4	1	10	1
Metabolic	0	0	1	0	1	0
Others	3	1	1	0	4	0
Unknown	272	47	210	49	482	48

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 over the last 5 years in that cadaveric renal transplant is now the most common transplantation done accounting for about 42% compared to 36% for living related renal transplant. About a fifth of renal transplant were done overseas mainly the commercial cadaveric programme.

Table 6.9: Types of Renal Transplantation, 1999-2008

Year	1999-2003		2004-2008	
	No.	%	No.	%
Commercial cadaver	12	18	19	21
Commercial living donor	3	4	1	1
Living related donor	33	49	32	36
Cadaver	20	29	37	42
Living emotionally related	0	0	0	0
TOTAL	68	100	89	100

SECTION E: SURVIVAL ANALYSIS

Renal transplantation has the best patient survival with 92% survival at 5 years and 89% at 9 years. HD and PD showed comparable survival curve up till about 7 years into dialysis when analyzed without consideration of change of modality of dialysis (as per ITT). However when censored for change of dialysis modality; separation of the survival curve occurred earlier, after about 3 years with PD patients showing a much poorer outcome compared to HD (fig 6.10b)

Table 6.10 (a): Patient survival by dialysis modality analysis (not censored with change of modality)

Modality Interval (months)	Transplant			PD			HD		
	No.	% survival	SE	No.	% survival	SE	No.	% survival	SE
0	137	100	-	348	100	-	302	100	-
6	120	99	1	313	97	1	278	97	1
12	111	98	1	273	93	1	246	94	1
24	88	97	2	205	85	2	196	91	2
36	68	96	2	166	83	2	143	87	2
48	52	94	3	125	80	3	113	84	3
60	42	92	3	97	79	3	81	83	3
72	32	89	4	70	76	3	57	80	3
84	20	89	4	38	74	4	42	80	3
96	15	89	4	20	71	4	29	80	3
108	9	89	4	11	71	4	20	77	4

Figure 6.10 (a): Patient survival by dialysis modality analysis (not censored with change of modality)

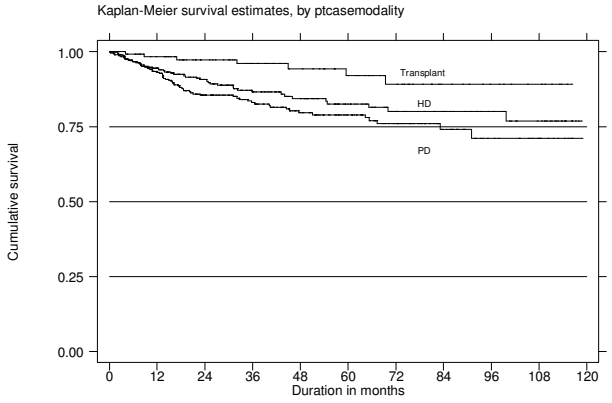


Figure 6.10 (b): Patient survival by dialysis modality analysis (censored with change of modality)

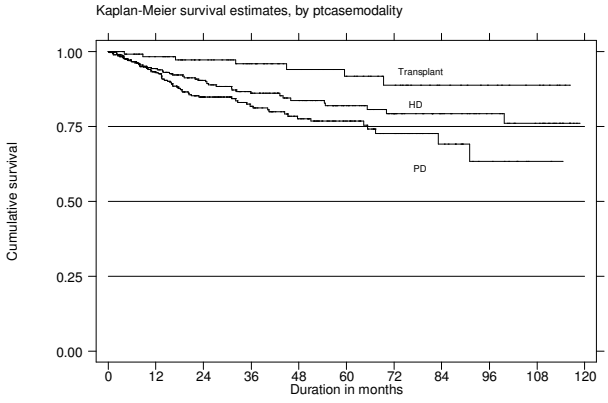


Table 6.10 (b): Patient survival by dialysis modality analysis (censored with change of modality)

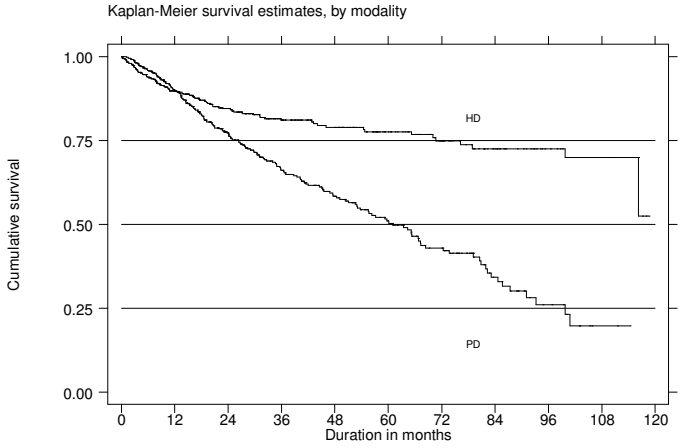
Modality Interval (months)	Transplant			PD			HD		
	No.	% survival	SE	No.	% survival	SE	No.	% survival	SE
0	137	100	-	348	100	-	302	100	-
6	117	99	1	308	97	1	271	97	1
12	108	98	1	261	93	1	235	94	1
24	85	97	2	183	85	2	186	90	2
36	65	96	2	133	82	2	135	86	2
48	49	94	3	98	78	3	107	84	3
60	40	92	4	70	77	3	77	82	3
72	31	89	4	47	73	4	54	79	3
84	20	89	4	21	69	5	39	79	3
96	15	89	4	10	63	7	28	79	3
108	9	89	4	3	63	7	19	76	5

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 51% for PD compared to 78% for HD.

Table 6.11: Dialysis Technique Survival by Modality, 1999-2008

Modality Interval (months)	PD			HD		
	No.	% survival	SE	No.	% survival	SE
0	348	100	-	302	100	-
6	408	96	1	390	94	1
12	347	90	1	333	90	1
24	238	77	2	252	84	2
36	169	66	3	184	81	2
48	125	58	3	147	79	2
60	87	51	3	102	78	2
72	60	43	3	75	75	3
84	27	34	4	51	72	3
96	12	26	4	33	72	3
108	3	20	5	19	70	4

Figure 6.11: Dialysis Technique Survival by Modality, 1999-2008



The graft survival for paediatric transplants was 89% for 1 year and 75% for 5 years.

Table 6.12: Transplant Graft Survival, 1999-2008

Interval (month)	No.	% survival	SE
0	137	100	-
6	117	91	2
12	108	89	3
24	85	86	3
36	65	83	4
48	49	77	4
60	40	75	5
72	31	71	5
84	20	65	6
96	15	65	6
108	9	65	6

Figure 6.12: Transplant Graft Survival, 1999-2008