

## CHAPTER 2: DIALYSIS IN MALAYSIA

### Summary

- By year end 2002, a total of 2223 patients were accepted for dialysis compared to 43 patients in 1980
- Prevalent dialysis patients increased rapidly from a total 59 in 1980 to 8954 in 2002.
- Acceptance rate for dialysis increased very rapidly from 3 per million population to 91 per million in 2002.
- The dialysis prevalence rate increased from 4 per million population in 1980 to 365 per million in 2002 and 391 per million in 2003.
- The average dialysis acceptance rate had increased by 12-fold in the new millennium compared to the period of the 1980's.
- The average dialysis prevalence rate increased by 14-fold between time periods of 2000-2002 and the 1980's.
- The most economically developed, west coast states of Peninsular Malaysia registered the highest level of provision of new dialysis treatment at more than 100 per million state population since 2000. The less developed states of Terengganu, Kedah & Perlis and Sarawak registered provision rates of 59 and 72 per million state population and the 3 economically least developed states of Malaysia – Pahang, Kelantan and Sabah had the lowest dialysis provision at 32 to 50 per million state population.
- All the states showed remarkable increase in dialysis treatment rate but the disparity between states in provision of dialysis remained throughout this whole period.
- There was an initial bias against females being accepted into dialysis programmes but this bias was not seen after the early 1990's.
- The modal age group for dialysis treatment increased from 35-44 years in the 1980's to 55-64 years after 1992.
- Treatment rates for those above 55 years rose rapidly and accounted for the largest proportion of new intake of patients each year in the last 10 years.
- There was rapid growth of centre haemodialysis and disappearance of home/office haemodialysis since the mid 1990's. CAPD contributed to about 10-20% of new dialysis treatment.
- There was progressively increased funding for dialysis by charitable organizations noted from the 1990's.
- By 2002, 40% of patients were dialysed in government centres, 35% in NGO centres and 25% in private dialysis centres compared to the 1980's when more than 90% received treatment from government centres.
- Diabetes mellitus accounted for 50% of new ESRD patients and the proportion of patients with unknown cause decreased from 81% in 1980 to 30% in 2003.
- Death rates on haemodialysis have remained at 10% or lower per year throughout the years 1980 to 2003; CAPD death rates were higher at 10 to 20%.
- Cardiovascular cause of death, death at home and sepsis were the 3 commonest causes of death in the dialysis population.

### 2.1 Dialysis Treatment Provision Overall

The stock and flow of all dialysis patients between 1980 and 2003 is shown in Table 2.1.1. In the year 2002, a total of 2223 patients were accepted for dialysis compared to only 43 patients in 1980. The total number of patients dialyzing at the end of each year has increased exponentially from 59 in 1980 to 8954 in 2002 and 9795 in 2003.

As shown in Table 2.1.2a, the acceptance rate for dialysis has increased rapidly from 3 per million in 1980 to 91 per million population in 2003. The prevalence rates of all dialysis patients have similarly shown this tremendous increase from 4 per million in 1980 to 365 per million in 2002 and at least 391 in 2003.

For ease of comparison and from the increase noted in the dialysis acceptance rates per year, the dialysis acceptance rates were divided into 4 periods of 1980-1989, 1990-1994, 1995-1999 and

2000-2002 as shown in Table 2.1.2b and Figures 2.1.2 b & c. The new dialysis acceptance rate increased by two and a half times from the period 1980-1989 to the period 1990-1995; by three fold over the next five years, and 1.6 fold after 2000 compared to the period 1995-1999. The dialysis acceptance rate had increased by 12-fold in the new millennium compared to the period of the 1980's. Comparison of prevalence rates over the same time periods showed an almost 3 fold increase between periods 1990-1994 compared to the ten-year period of the 1980's; and between the later half of the 1990's compared to the earlier half of the 1990's; and an almost 2-fold increase between 2000-2003 compared to the period just before 2000. The prevalence rates increased by 14-fold between time periods of 2000-2002 and the 1980's.

**Table 2.1.1** Stock and flow – Dialysis Patients 1980 – 2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
Died	6	3	14	22	27	26	47	31	38	65	70	87
Transplanted	21	21	31	21	26	14	6	35	50	38	43	45
Lost to Follow-up	0	0	0	0	1	1	1	2	0	1	1	2
Dialysing at 31 <sup>st</sup> Dec	59	124	195	252	334	406	467	543	634	704	838	972

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
Died	95	102	146	178	222	314	373	486	581	786	874	993
Transplanted	47	36	45	36	56	59	61	69	106	134	141	103
Lost to Follow-up	3	2	2	5	5	6	9	7	12	26	43	63
Dialysing at 31 <sup>st</sup> Dec	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795

**Table 2.1.2a** Dialysis Treatment Rate per million population 1980 – 2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Acceptance rate	3	5	7	6	8	7	7	8	9	9	13	13
Prevalence rate	4	9	13	17	22	26	29	32	37	40	46	52

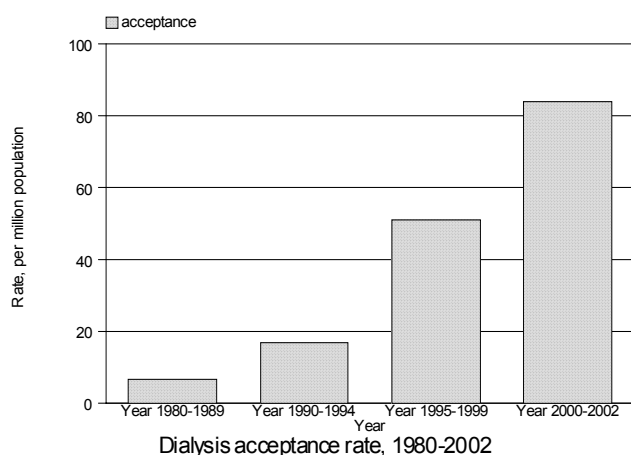
  

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Acceptance rate	17	17	26	33	44	52	56	68	77	85	91	80
Prevalence rate	62	72	87	108	138	170	204	243	284	324	365	391

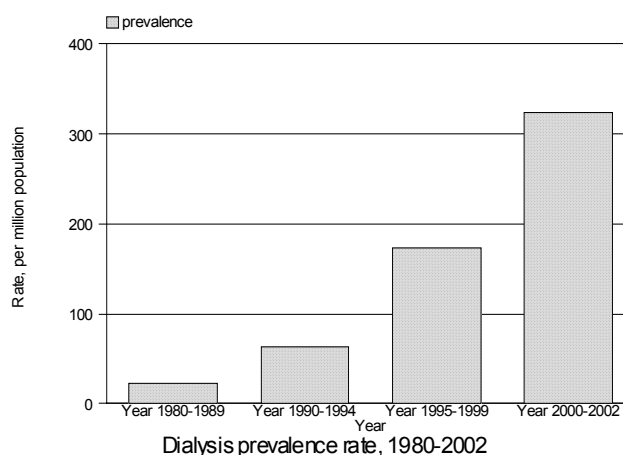
**Table 2.1.2b** Average Treatment Rate per million population: Comparing 4 time periods

	1980-1989	1990-1994	1995-1999	2000-2002
New Dialysis Acceptance rate	7	17	51	84
Dialysis Prevalence rate	23	64	173	324

**Figure 2.1.2b** New Dialysis Treatment Rate per million population, Comparing 4 periods



**Figure 2.1.2c** Dialysis Prevalence Rate per million population, Comparing 4 periods



## 2.2 Geographic Distribution of Dialysis Treatment Provision

Historically, dialysis treatment started in Kuala Lumpur hospital located in the states of Selangor & Wilayah Persekutuan, hence it is not surprising that this state showed the highest dialysis treatment rate in the first 10-years of dialysis treatment. The subsequent spread of dialysis treatment throughout the rest of the country was uneven, resulting in considerable variation in dialysis provision among the various states of Malaysia (Table 2.2.1). In the period 2000-2002, 7 states have registered dialysis treatment rate in excess of 100 per million state population (pmp) (referred to as high provision states in Table 2.2.2), 3 states in the range 50 to 100 pmp (mid provision states), and 4 with treatment rates below 50 pmp (low provision states).

We have no reason to believe that the incidence of end stage renal disease (ESRD) would vary so markedly among the various states to account for the uneven distribution in treatment rates. On the other hand, it is no coincidence that

the high provision states are also the most economically developed states in Malaysia located mainly along the west coast of Peninsular Malaysia, while the 4 economically least developed states of Malaysia – Pahang, Kelantan, Sarawak and Sabah had the lowest dialysis provision. And this has always been so since the 1980s. While all states have increased dialysis treatment rates since the 1980s, the best provided states have experienced the largest increase, and the least provided states the least (Table 2.2.2, Figure 2.2.2). Understandably, private dialysis providers would preferentially locate their dialysis facilities in economically more advanced states, however providers from the NGO and public sectors, which together account for 70% of total dialysis provision in the country, have less reason to do the same. We can find no justification for such persistent geographic inequity in dialysis provision.

**Table 2.2.1** Dialysis Treatment Rate by State, per million state population, 1980-2003

State	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Negeri Melaka	6	4	4	6	8	10	2	10	4	13	22	20
Johor Darul Takzim	2	5	7	3	4	5	3	4	9	10	15	17
Negeri Sembilan	2	3	12	8	8	2	12	15	6	3	7	17
Pulau Pinang	5	5	9	3	7	10	5	12	7	15	17	11
Selangor & W.Persekutuan	21	32	38	33	40	31	33	36	46	68	28	32
Perak Darul Redzuan	2	5	6	5	8	8	8	7	8	12	14	16
Terengganu Darul Iman	0	2	5	0	0	0	1	3	4	4	6	4
Kedah & Perlis	2	2	2	3	9	4	4	5	6	2	3	5
Kelantan Darul Naim	0	0	0	4	3	2	3	3	4	4	5	2
Sarawak	1	2	3	6	5	7	8	7	9	13	12	11
Pahang Darul Makmur	4	4	1	3	5	3	5	10	5	4	10	8
Sabah	0	3	2	2	3	2	3	2	3	1	8	11

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Negeri Melaka	40	32	69	74	82	95	111	91	147	151	145	95
Johor Darul Takzim	18	27	45	42	57	79	71	104	131	136	145	125
Negeri Sembilan	19	30	39	48	74	73	90	94	116	113	133	123
Pulau Pinang	14	16	30	73	70	85	109	124	102	120	130	86
Selangor & W.Persekutuan	39	32	40	63	82	76	90	102	121	116	122	105
Perak Darul Redzuan	19	24	28	28	57	62	64	75	106	101	110	91
Terengganu Darul Iman	4	16	15	18	27	37	34	36	37	76	87	66
Kedah & Perlis	18	12	19	18	26	54	47	59	68	64	85	72
Kelantan Darul Naim	2	5	7	10	6	11	15	26	31	59	60	65
Sarawak	16	13	21	20	36	46	33	44	51	67	58	55
Pahang Darul Makmur	14	12	13	20	17	44	36	47	48	52	51	60
Sabah	7	4	11	12	18	16	24	32	25	36	35	39

**Table 2.2.2** Dialysis Treatment Rate by State, per million state population over 4 periods

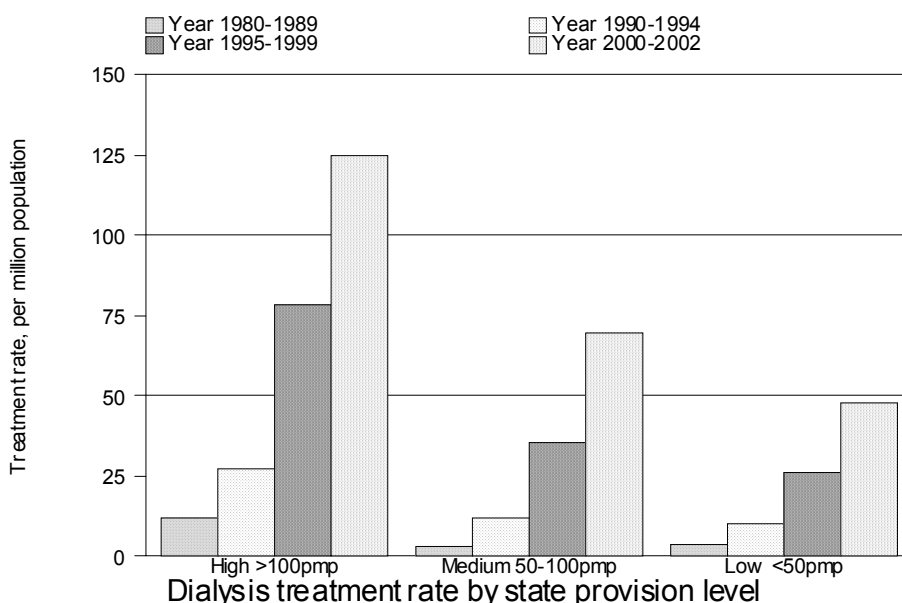
State	1980-89	1990-94	1995-99	2000-02
Negeri Melaka	7	41	91	148
Johor Darul Takzim	5	25	71	137
Negeri Sembilan	7	23	76	121
Pulau Pinang	8	18	92	117
Selangor & W.Persekutuan	38	36	83	120
Perak Darul Redzuan	7	21	57	106
Terengganu Darul Iman	2	9	30	67
Kedah & Perlis	4	14	41	72
Kelantan Darul Naim	2	4	14	50
Sarawak	6	16	36	59
Pahang Darul Makmur	4	13	33	50
Sabah	2	7	20	32

**Table 2.2.3** Classification of level of provision

State	2000-02	Level of provision 2000 -2002
Negeri Melaka	148	High (>100 pmp)
Johor Darul Takzim	137	
Negeri Sembilan	121	
Selangor & W.Persekutuan	120	
Pulau Pinang	117	
Perak Darul Redzuan	106	Mid (>50-100 pmp)
Kedah & Perlis	72	
Terengganu Darul Iman	67	
Sarawak	59	
Kelantan Darul Naim	50	Low (<=50 pmp)
Pahang Darul Makmur	50	
Sabah	32	

**Table 2.2.4** Average Dialysis Treatment Rate per million state population (pmp) over 4 periods in Low, Mid and High provision states, 1980-2002

	1980-1989	1990-1994	1995-1999	2000-2002
High provision states (>100 pmp)	12	27	78	125
Mid provision states (>50-100 pmp)	4	13	36	66
Low provision states (<=50 pmp)	3	8	22	44

**Figure 2.2.4** Average Dialysis Treatment Rate per million state population (pmp) over 4 periods in Low (<=50 pmp), Mid (50-100 pmp) and High (>100 pmp) provision states, 1980-2002

### 2.3 Dialysis Treatment in Relation to Gender

Table 2.3.1 and Figure 2.3.1 show the dialysis treatment rate by gender. Dialysis treatment rate for males increased from 6 per million male population in 1980 to 105 per million in 2002 compared to the rates of 2 and 90 per million female population for females in 1980 and 2002 respectively.

In the 1980s new dialysis patients were disproportionately male. Since then, as treatment provision has increased markedly, the proportion of female patients have steadily improved (Table and

Figure 2.3.2). This convergence in male and female treatment rates implies that there has always been a gender bias in dialysis provision in the early years of chronic dialysis treatment in Malaysia when dialysis provision was scarce and males were preferentially treated. We believe this reflects a cultural bias which placed a greater value on male life, rather than a conscious decision on the part of nephrologists or policy makers.

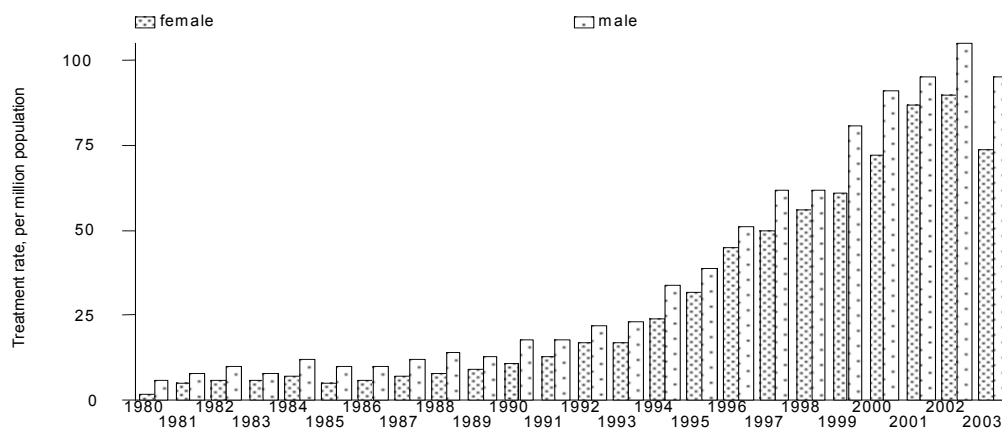
**Table 2.3.1** Dialysis Treatment Rate by Gender, per million male or female population 1980– 2003

Gender	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Male	6	8	10	8	12	10	10	12	14	13	18	18
Female	2	5	6	6	7	5	6	7	8	9	11	13

Gender	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Male	22	23	34	39	51	62	62	81	91	95	105	95
Female	17	17	24	32	45	50	56	61	72	87	90	74

**Figure 2.3.1** Dialysis Treatment by Gender 1980 – 2003



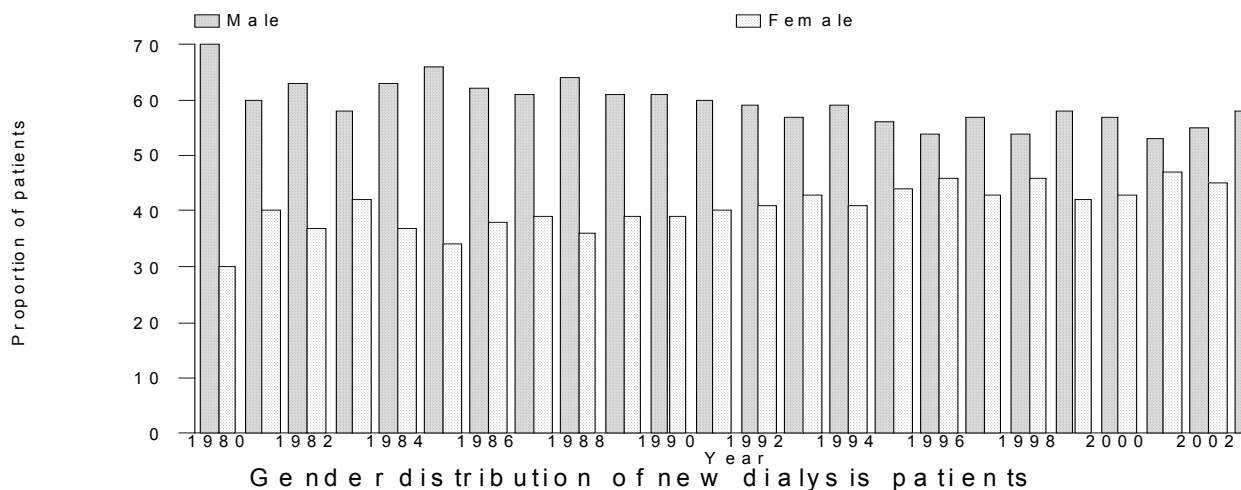
**Table 2.3.2** Gender distribution of Dialysis Patients 1980-2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
% Male	70	60	63	58	63	66	62	61	64	61	61	60
% Female	30	40	37	42	37	34	38	39	36	39	39	40
Dialysing at 31 <sup>st</sup> December	59	124	195	252	334	406	467	543	634	704	838	972
% Male	73	67	66	63	62	62	63	61	62	63	63	62
% Female	27	33	34	37	38	38	37	39	38	37	37	38

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% Male	59	57	59	56	54	57	54	58	57	53	55	58
% Female	41	43	41	44	46	43	46	42	43	47	45	42
Dialysing at 31 <sup>st</sup> December	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795
% Male	61	60	60	59	57	57	56	56	56	55	55	55
% Female	39	40	40	41	43	43	44	44	44	45	45	45

**Figure 2.3.2** Gender Distribution of New Dialysis patients 1980 – 2003



## 2.4 Dialysis Treatment in Relation to Age

In the 1980's, patients in the working age groups (age 25-54 years) have the highest treatment rates, perhaps as expected. In subsequent years with increasing availability of dialysis treatment, the older age groups with higher incidence of ESRD have benefited the most. Treatment rates increased most rapidly for patients over the age of 55 years and are still rising for those 65 years and older. In contrast, intake rates for those 25-44 years of age have almost leveled off, suggesting perhaps that in recent years no ESRD patients in this age group are denied treatment. The intake rate for children less than 15 years of age were almost nil until the

early 1990's and has remained at about 4 per million child population since 1999. (Table 2.4.1 and Figure 2.4.1.) With these population treatment rates, new patients in the young adult age groups (ages of 25 to 44 years) accounted for the largest proportion of patients on dialysis in the 1980s. In subsequent years, older patients accounted for an increasingly larger proportion of the dialysis population in this country. By the years 2002-2003, patients age  $\geq 55$  years accounted for half the new intakes, though a smaller proportion of prevalent patients on account of higher mortality in this age group (Table and Figures 2.4.2).

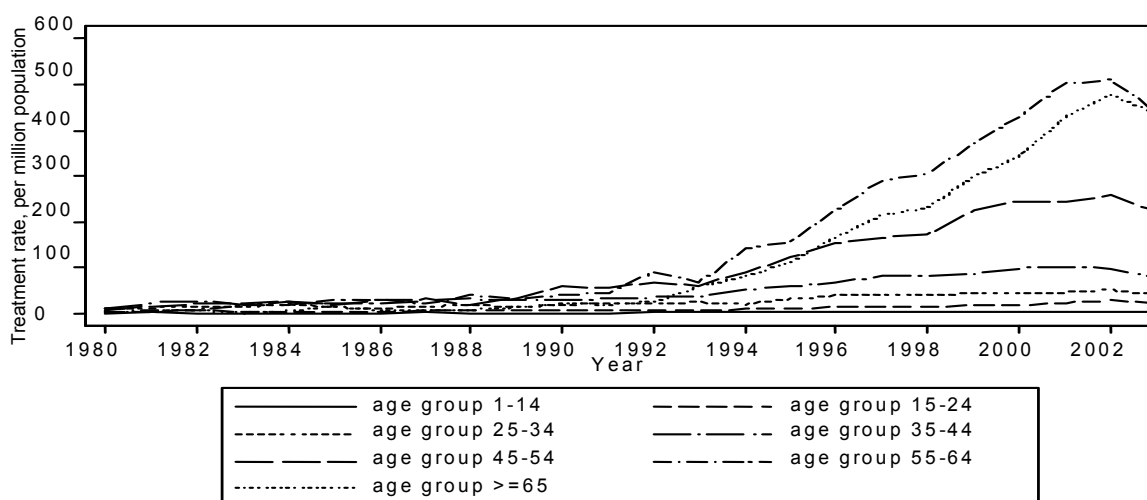
**Table 2.4.1** Dialysis Treatment Rate by Age Group, per million age group population 1980 – 2003

Age groups (years)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1-14	0	1	0	0	0	0	0	1	0	0	0	0
15-24	2	4	5	4	3	3	2	5	5	6	7	7
25-34	9	11	15	13	20	12	10	14	18	13	18	22
35-44	10	22	26	18	24	20	21	26	31	27	27	32
45-54	7	13	21	21	24	19	29	31	18	33	59	55
55-64	10	6	8	18	19	27	30	20	39	30	40	45
$\geq 65$	2	4	6	0	5	14	7	5	8	12	21	19

Age groups (years)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1-14	1	1	1	2	3	3	3	4	4	4	4	4
15-24	6	5	9	10	13	15	15	16	18	22	28	21
25-34	22	23	19	31	39	39	40	43	46	46	50	41
35-44	35	37	51	58	67	80	81	85	98	100	98	78
45-54	66	59	88	121	154	166	172	225	245	244	258	223
55-64	90	67	141	156	226	289	306	370	429	502	511	440
$\geq 65$	25	58	81	111	167	214	230	299	343	428	479	436

**Figure 2.4.1** Dialysis Treatment Rate by Age Group 1980 - 2003

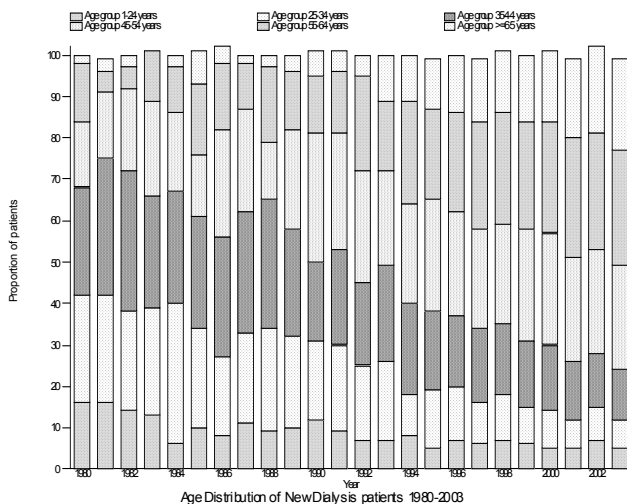


**Table 2.4.2** Percentage Age Distribution of Dialysis Patients 1980 – 2003

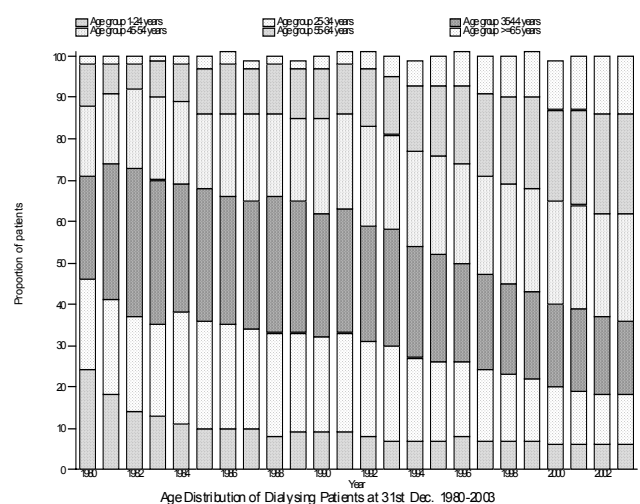
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>New dialysis patients</b>	43	73	104	93	118	106	108	131	162	161	233	247
% 1-14 years	2	5	0	0	1	2	2	2	2	1	1	0
% 15-24 years	14	11	14	13	5	8	6	9	7	9	11	9
% 25-34 years	26	26	24	26	34	24	19	22	25	22	19	21
% 35-44 years	26	33	34	27	27	27	29	29	31	26	19	23
% 45-54 years	16	16	20	23	19	15	26	25	14	24	31	28
% 55-64 years	14	5	5	12	11	17	16	11	18	14	14	15
% ≥ 65 years	2	3	3	0	3	8	4	2	3	4	6	5
<hr/>												
<b>Dialysing at 31<sup>st</sup> December</b>	59	124	195	252	334	406	467	543	634	704	838	972
% 1-14 years	2	4	2	1	1	1	1	1	1	1	1	1
% 15-24 years	22	14	12	12	10	9	9	9	7	8	8	8
% 25-34 years	22	23	23	22	27	26	25	24	25	24	23	24
% 35-44 years	25	33	36	35	31	32	31	31	33	32	30	30
% 45-54 years	17	17	19	20	20	18	20	21	20	20	23	23
% 55-64 years	10	7	6	9	9	11	12	11	12	12	12	12
% ≥ 65 years	2	2	2	1	2	3	3	2	2	2	3	3
<hr/>												
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<b>New dialysis patients</b>	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% 1-14 years	2	2	2	1	2	1	2	2	1	1	2	1
% 15-24 years	5	5	6	4	5	5	5	4	4	4	5	4
% 25-34 years	18	19	10	14	13	10	11	9	9	7	8	7
% 35-44 years	20	23	22	19	17	18	17	16	16	14	13	12
% 45-54 years	27	23	24	27	25	24	24	27	27	25	25	25
% 55-64 years	23	17	25	22	24	26	27	26	27	29	28	28
% ≥ 65 years	5	11	11	12	14	15	15	16	17	19	21	22
<hr/>												
<b>Dialysing at 31<sup>st</sup> December</b>	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795
% 1-14 years	1	1	1	1	2	2	2	2	1	1	1	1
% 15-24 years	7	6	6	6	6	5	5	5	5	5	5	5
% 25-34 years	23	23	20	19	18	17	16	15	14	13	12	12
% 35-44 years	28	28	27	26	24	23	22	21	20	20	19	18
% 45-54 years	24	23	23	24	24	24	24	25	25	25	25	26
% 55-64 years	14	14	16	17	19	20	21	22	22	23	24	24
% ≥ 65 years	4	5	6	7	8	9	10	11	12	13	14	14

**Figure 2.4.2** Age Distribution of Dialysis patients 1980 – 2003

a) New Dialysis patients



b) Dialysing patients at 31st December



## 2.5 Method and Location

Trends in the method and location of dialysis therapy reflect the prevailing conditions and funding of the ESRD programme.

Home or office HD is dialysis carried out at the patient's own home or in the work-place where a HD machine may be shared by several patients belonging to the same institution or company.

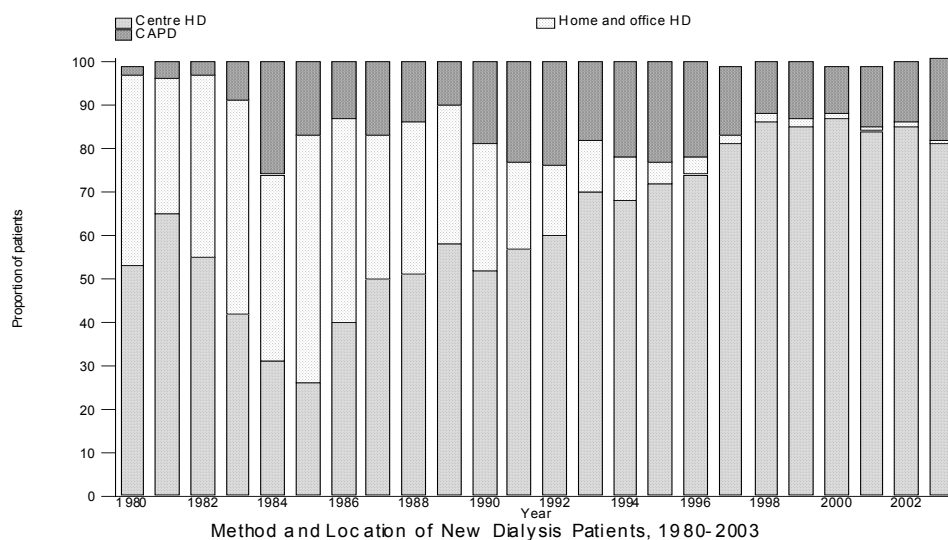
From Table and Figure 2.5.1 in the 1980's so-called home or office HD made up a third to half of new dialysis treatment. Since the mid 1990's the proportion of new patients started on home HD has been almost negligible and 80-90% of new patients were accepted into centre HD. The proportion of patients accepted into the CAPD programme increased in the early 1990's to about 22-24%, plateaued in the mid 1990's; decreased in the late 1990's to 11% on account of the Asian financial crisis, and increased slightly again in the new millennium. The percentage of prevalent patients on

center HD increased at the expense of both the home HD and CAPD patients and has remained at 87% of total prevalent dialysis patients since 2000. Several reasons could account for this trend in method and location of dialysis. Firstly, in the early years of dialysis provision, when funds were scarce and there were very few HD centers (which were mainly located in the big towns), those who could afford but were not situated within commuting distance of HD centres were provided with home/office HD throughout the country. Secondly, increase in public funding resulted in rapid expansion of HD centers providing center HD in the public and private sectors as well as the centers run by charitable organizations. Thirdly, it was perceived that there were more profits to be made from center HD than CAPD – a modality of treatment provided mainly by public sector dialysis facilities with nephrologists.

**Table 2.5.1** Method and Location of Dialysis 1980 - 2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
% Centre HD	53	65	55	42	31	26	40	50	51	58	52	57
% Home and office HD	44	31	42	49	43	57	47	33	35	32	29	20
% CAPD	2	4	3	9	26	17	13	17	14	10	19	23
Dialysing at 31 <sup>st</sup> Dec	59	124	195	252	334	406	467	543	634	704	838	972
% Centre HD	55	59	52	50	44	42	44	47	48	54	55	57
% Home and office HD	45	39	45	46	45	48	47	44	42	39	36	32
% CAPD	0	2	3	4	11	10	9	9	9	7	9	12
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% Centre HD	60	70	68	72	74	81	86	85	87	84	85	81
% Home and office HD	16	12	10	5	4	2	2	2	1	1	1	1
% CAPD	24	18	22	23	22	16	12	13	11	14	14	19
Dialysing at 31 <sup>st</sup> Dec	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795
% Centre HD	60	65	68	72	75	79	82	85	87	87	87	87
% Home and office HD	27	21	18	13	10	8	6	5	4	3	3	2
% CAPD	14	14	14	15	15	14	12	11	10	10	10	11

**Figure 2.5.1** Method and Location of New Dialysis Patients 1980 - 2003



## 2.6 Funding for Dialysis Treatment

Dialysis provision is closely linked with economics. With the rapid development of dialysis provision in this country, it would be important to know the source of funding for dialysis therapy.

The government directly funded three quarters of dialysis treatment when chronic dialysis was first started. Over the years however, the proportion of dialysis treatment directly funded by the government had declined to about 50% in the last 5 years since 1998. The proportion of new and existing patients providing their own funds for dialysis treatment fluctuated from 18 to 46% but has remained at about 30% over the last 5 years. The

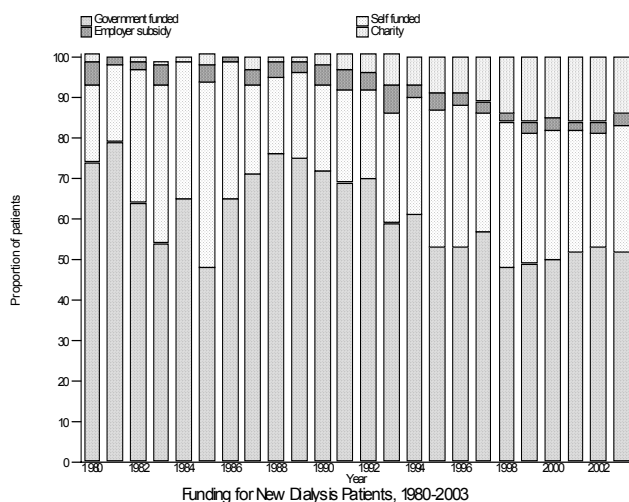
most obvious change in the trend of funding was the contribution by charitable organizations – so called non-governmental organizations (NGO), which accounted for 16% of the total funding in 2002 compared to only 3% in 1990 and about 0-3% in the 1980's. (Table 2.6.1 & Figure 2.6.1) This increase in funding by NGOs for dialysis treatment came about as a result of increased public awareness and support, increasing affluence of society, and dialysis subsidies from the government for dialysis treatment provided to very poor patients by NGO centres.

**Table 2.6.1** Funding for Dialysis Treatment 1980 – 2003

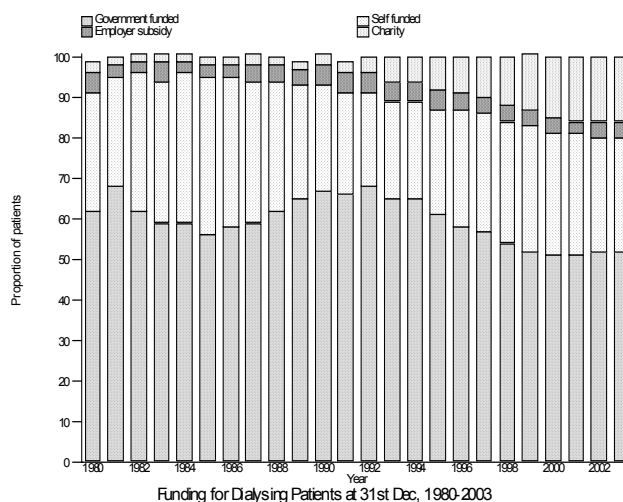
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
% by Government	74	79	64	54	65	48	65	71	76	75	72	69
% self funded	19	19	33	39	34	46	34	22	19	21	21	23
% subsidized by Employer	6	2	2	5	0	4	1	4	4	3	5	5
% by Charity	2	0	1	1	1	3	0	3	1	1	3	4
Dialysing at 31 <sup>st</sup> December	59	124	195	252	334	406	467	543	634	704	838	972
% by Government	62	68	62	59	59	56	58	59	62	65	67	66
% self funded	29	27	34	35	37	39	37	35	32	28	26	25
% subsidized by Employer	5	3	3	5	3	3	3	4	4	4	5	5
% by Charity	3	2	2	2	2	2	2	3	2	2	3	3
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% by Government	70	59	61	53	53	57	48	49	50	52	53	52
% self funded	22	27	29	34	35	29	36	32	32	30	28	31
% subsidized by Employer	4	7	3	4	3	3	2	3	3	2	3	3
% by Charity	5	8	7	9	9	11	14	16	15	16	16	14
Dialysing at 31 <sup>st</sup> December	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795
% by Government	68	65	65	61	58	57	54	52	51	51	52	52
% self funded	23	24	24	26	29	29	30	31	30	30	28	28
% subsidized by Employer	5	5	5	5	4	4	4	4	4	3	4	4
% by Charity	4	6	6	8	9	10	12	14	15	16	16	16

**Figure 2.6.1** Funding for Dialysis Treatment 1980 – 2003

(a) New Dialysis Patients at 31st December 2003



(b) Dialysing patients at 31st December 2003



## 2.7 Distribution of Dialysis Treatment by Sector

The percentage of new patients dialysed in government centres has decreased from more than 90% in the 1980's to about 40% in 2000's. The proportion of new patients dialysed in NGO centres increased rapidly from 6% in 1990 to about 30% since 1998 and those in private centres from 7% to 30% over the same period. The same trend is seen for prevalent patients (Table 2.7.1 and Figures 2.7.1 a & b).

The 3 sectors – government, NGOs, and private dialysis provided about 40%, 35% and 25% respectively of all dialysis treatment in the last few years. However, as noted in the previous section,

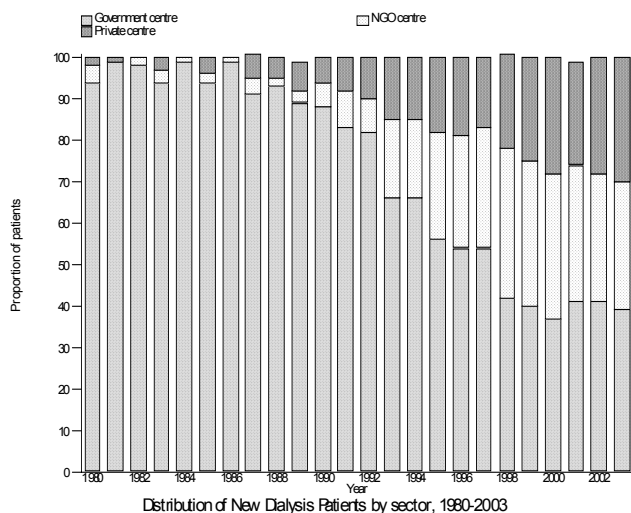
half the funds for dialysis treatment were still provided directly by government agencies. This discrepancy arose not because the cost per dialysis was higher in government centres but because a fair proportion of government pensioners and serving government servants received dialysis treatment in NGO and private centres but whose dialysis therapy were paid for by their respective government agencies. The proportion of government funding for dialysis therapy would be even higher if we were to include the subsidies provided to NGO centres for dialysis treatment to the very low-income group.

**Table 2.7.1** Distribution of Dialysis Patients by Sector 1980 - 2003

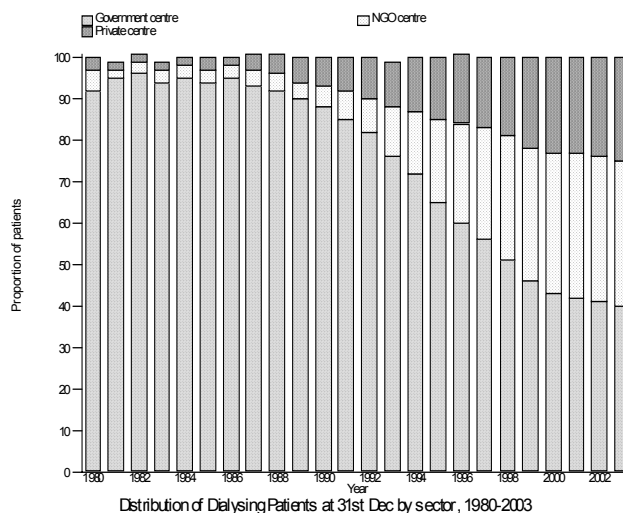
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
% Government centre	94	99	98	94	99	94	99	91	93	89	88	83
% NGO centre	4	0	2	3	1	2	1	4	2	3	6	9
% Private centre	2	1	0	3	0	4	0	6	5	7	6	8
Dialysing at 31 <sup>st</sup> Dec	59	124	195	252	334	406	467	543	634	704	838	972
% Government centre	92	95	96	94	95	94	95	93	92	90	88	85
% NGO centre	5	2	3	3	3	3	3	4	4	4	5	7
% Private centre	3	2	2	2	2	3	2	4	5	6	7	8
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% Government centre	82	66	66	56	54	54	42	40	37	41	41	39
% NGO centre	8	19	19	26	27	29	36	35	35	33	31	31
% Private centre	10	15	15	18	19	17	23	25	28	25	28	30
Dialysing at 31 <sup>st</sup> Dec	1178	1399	1743	2230	2914	3689	4519	5522	6663	7775	8954	9795
% Government centre	82	76	72	65	60	56	51	46	43	42	41	40
% NGO centre	8	12	15	20	24	27	30	32	34	35	35	35
% Private centre	10	11	13	15	17	17	19	22	23	23	24	25

**Figure 2.7.1** Distribution of Dialysis Patients by Sector 1980 – 2003

(a) New Dialysis Patients



(b) Dialysing Patients at 31<sup>st</sup> December



## 2.8 Primary Renal Disease

Patient selection for ESRD treatment is one of the main reasons for the trends in the primary renal disease shown in Table 2.8.1. In the initial years of dialysis therapy, younger patients without diabetes were selected for chronic dialysis or renal transplantation. However with increased dialysis provision and acceptance of older patients for RRT, diabetes mellitus has become the main cause of ESRD accounting for 50% of new ESRD patients. The rising prevalence of diabetes mellitus associated with increasing affluence over the last 10 to 15 years no doubt account in part for the rising incidence of diabetic nephropathy. This has grave implications for the programme of chronic kidney disease prevention and also on the outcome of patients on dialysis.

The proportion of patients with unknown primary renal disease has decreased over the years from 81% in 1980 to about 30% since 1998 presumably because of better and easier access to health care resulting in earlier detection of renal disease. A decreasing proportion of patients had chronic glomerulonephritis as the cause of the ESRD. However, a significant proportion of the ESRD of unknown cause may be due to chronic glomerulonephritis. Obstructive nephropathy still remained a significant cause of ESRD. Systemic lupus erythematosus (SLE) too contributed to about 1 to 2% of new ESRD patients each year.

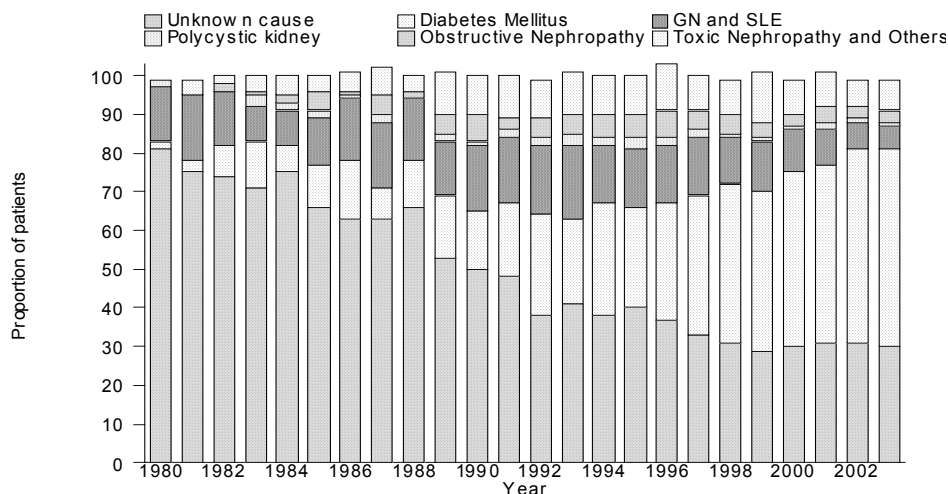
**Table 2.8.1** Primary Renal Disease 1980– 2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
New Dialysis patients	43	73	104	93	118	106	108	131	162	161	233	247
% Unknown cause	81	75	74	71	75	66	63	63	66	53	50	48
% Diabetes Mellitus	2	3	8	12	7	11	15	8	12	16	15	19
% GN	14	16	14	9	9	11	14	16	15	13	16	16
% SLE	0	1	0	0	0	1	2	1	1	1	1	1
% Polycystic kidney	2	0	0	3	2	2	1	2	0	2	1	2
% Obstructive Nephropathy	0	0	2	1	2	5	1	5	2	5	7	3
% Toxic Nephropathy	0	0	0	1	0	0	0	1	0	1	0	0
% Others	0	4	2	3	5	4	5	6	4	10	10	11

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
New Dialysis patients	333	339	514	680	939	1130	1237	1538	1811	2036	2223	1992
% Unknown cause	38	41	38	40	37	33	31	29	30	31	31	30
% Diabetes Mellitus	26	22	29	26	30	36	41	41	45	46	50	51
% GN	17	17	13	13	13	13	11	11	9	7	6	5
% SLE	1	2	2	2	2	2	1	2	2	2	1	1
% Polycystic kidney	2	3	2	3	2	2	1	1	1	2	1	1
% Obstructive Nephropathy	5	5	6	6	7	5	5	4	3	4	3	3
% Toxic Nephropathy	0	1	0	0	1	0	0	1	0	1	0	0
% Others	10	10	10	10	11	9	9	12	9	8	7	8

**Figure 2.8.1** Primary Renal Disease for New Dialysis Patients 1980– 2003



Primary Renal Disease of New Dialysis Patients, 1980-2003

## 2.9 Death on Dialysis

From Table 2.9.1 death rates on HD have consistently been 10% or lower per year from 1980's when mainly young patients were selected for chronic dialysis to 2000's when a much higher proportion of older and diabetic patients were accepted into the programme. There may possibly be a trend towards higher mortality in HD patients over the last 3 years as shown in Figure 2.7.1. CAPD patients showed a consistently higher mortality compared with HD with large fluctuations

in the early years but averaging between 14 to 18% per year in the last 10 years.

The data on causes of death is not as reliable. Cardiovascular mortality and death at home still remain the two commonest causes of death with sepsis either as the second or third commonest cause of death. CAPD peritonitis accounted for less than 4% of the total causes of death (Table 2.9.2).

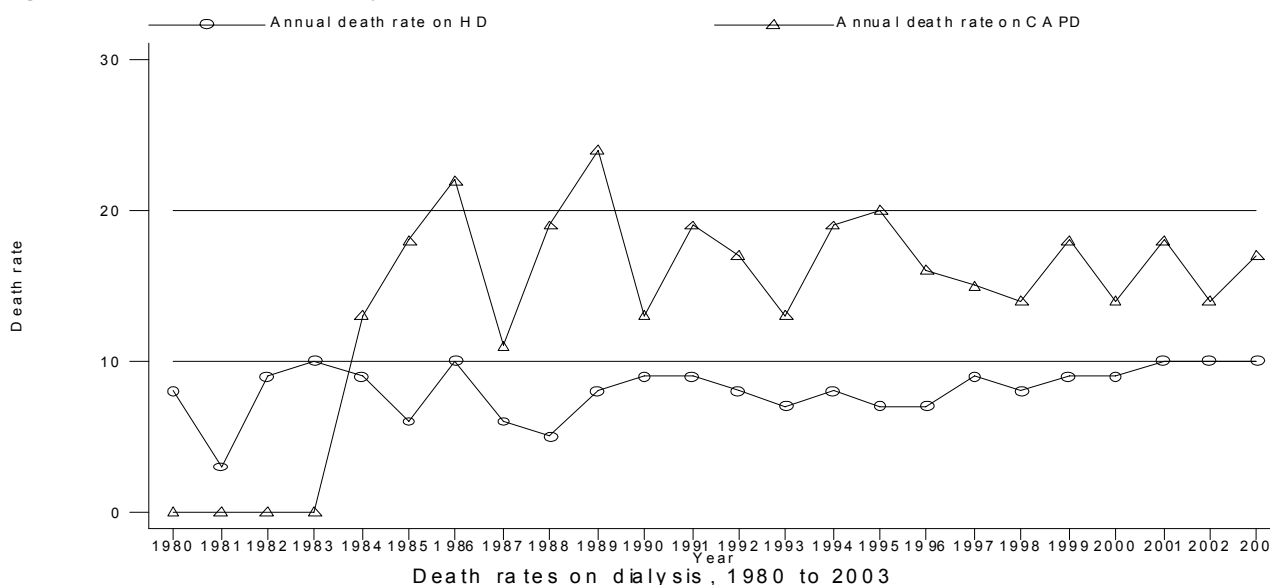
**Table 2.9.1** Deaths on Dialysis 1980 – 2003

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
No. of dialysis patients at risk	59	92	160	224	293	370	437	505	589	669	771	905
Dialysis deaths	6	3	14	22	27	26	47	31	38	65	70	87
Dialysis death rate %	10	3	9	10	9	7	11	6	6	10	9	10
No. of HD patients at risk	59	90	155	216	270	332	396	460	535	616	708	810
HD deaths	5	3	14	22	24	19	38	26	28	52	62	69
HD death rate %	8	3	9	10	9	6	10	6	5	8	9	9
No. of CAPD patients at risk	0	2	5	8	24	39	41	45	54	54	64	95
CAPD deaths	1	0	0	0	3	7	9	5	10	13	8	18
CAPD death rate %	0	0	0	0	13	18	22	11	19	24	13	19

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
No. of dialysis patients at risk	1075	1289	1571	1987	2572	3302	4104	5021	6093	7219	8365	9375
Dialysis deaths	95	102	146	178	222	314	373	486	581	786	874	993
Dialysis death rate %	9	8	9	9	9	10	9	10	10	11	10	11
No. of HD patients at risk	938	1112	1353	1700	2189	2831	3584	4454	5466	6506	7523	8393
HD deaths	72	79	104	120	160	241	299	386	491	658	759	826
HD death rate %	8	7	8	7	7	9	8	9	9	10	10	10
No. of CAPD patients at risk	137	177	218	287	384	471	521	567	627	713	842	982
CAPD deaths	23	23	42	58	62	73	74	100	90	128	115	167
CAPD death rate %	17	13	19	20	16	15	14	18	14	18	14	17

**Figure 2.9.1** Death Rates on Dialysis 1980 – 2003



**Table 2.9.2** Causes of Death on Dialysis 1980 - 2003

Year	1980		1981		1982		1983		1984		1985		1986		1987	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	1	17	0	0	0	0	3	14	5	19	2	8	13	28	6	19
Died at home	0	0	0	0	0	0	2	9	0	0	1	4	3	6	0	0
Sepsis	0	0	0	0	4	29	2	9	3	11	1	4	5	11	2	6
CAPD peritonitis	0	0	0	0	0	0	0	0	0	0	2	8	0	0	1	3
GIT bleed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liver disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	5	83	3	100	10	71	15	68	19	70	19	73	26	55	20	65
Unknown	0	0	0	0	0	0	0	0	0	0	1	4	0	0	2	6
total	6	100	3	100	14	100	22	100	27	100	26	100	47	100	31	100

Year	1988		1989		1990		1991		1992		1993		1994		1995	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	13	34	20	31	18	26	27	31	31	33	30	29	34	23	47	26
Died at home	4	11	8	12	12	17	11	13	9	9	9	9	21	14	23	13
Sepsis	1	3	6	9	12	17	12	14	14	15	20	20	17	12	35	20
CAPD peritonitis	1	3	2	3	2	3	1	1	1	1	0	0	7	5	0	0
GIT bleed	0	0	0	0	0	0	2	2	0	0	0	0	0	0	2	1
Cancer	0	0	0	0	0	0	0	0	0	0	2	2	6	4	5	3
Liver disease	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Others	18	47	25	38	24	34	26	30	36	38	34	33	42	29	55	31
Unknown	1	3	4	6	2	3	7	8	3	3	6	6	18	12	10	6
total	38	100	65	100	70	100	87	100	95	100	102	100	146	100	178	100

Year	1996		1997		1998		1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	53	24	87	28	123	33	157	32	208	36	267	34	335	38	335	34
Died at home	39	18	53	17	64	17	107	22	132	23	210	27	202	23	261	26
Sepsis	46	21	55	18	61	16	74	15	87	15	120	15	128	15	160	16
CAPD peritonitis	1	0	4	1	1	0	8	2	15	3	21	3	11	1	7	1
GIT bleed	2	1	2	1	8	2	13	3	10	2	15	2	18	2	20	2
Cancer	2	1	9	3	8	2	6	1	10	2	14	2	18	2	18	2
Liver disease	1	0	3	1	2	1	8	2	6	1	6	1	8	1	12	1
Others	55	25	69	22	75	20	92	19	89	15	105	13	131	15	150	15
Unknown	23	10	32	10	31	8	21	4	24	4	28	4	23	3	30	3
total	222	100	314	100	373	100	486	100	581	100	786	100	874	100	993	100