

# **CHAPTER 14**

## **RENAL TRANSPLANTATION**

Editor:

Dr. Goh Bak Leong

Expert Panel:

Dato' Dr. Zaki Morad b Mohd Zaher (Chair)

Dr. Goh Bak Leong (Co-Chair)

Dr. Fan Kin Sing

Dr. Lily Mushahar

Mr. Rohan Malek

Dr. S. Prasad Menon

Prof. Dr. Tan Si Yen

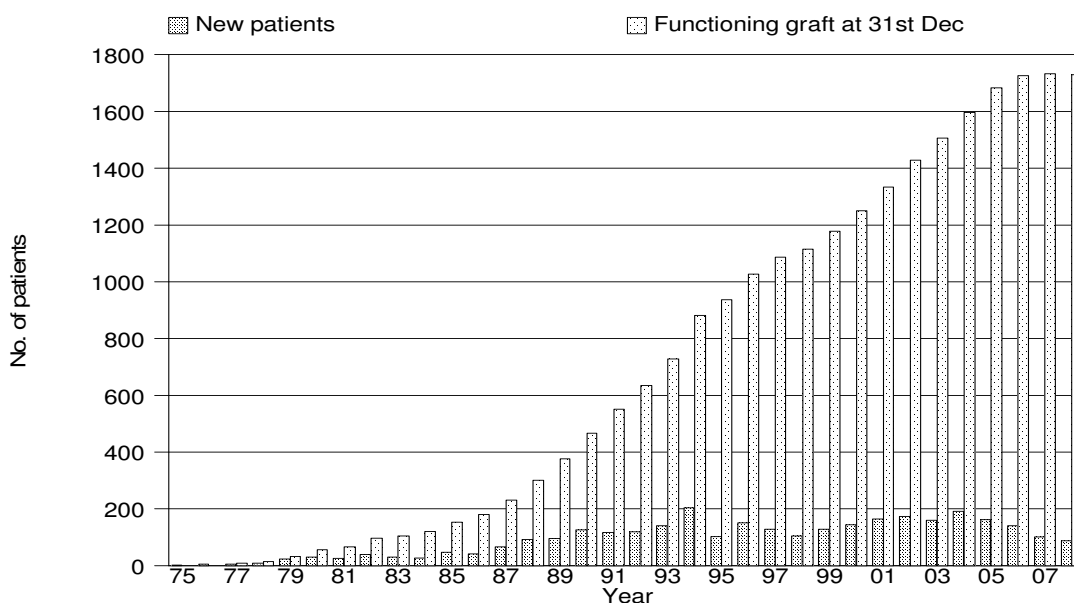
**SECTION 14.1: STOCK AND FLOW**

The number of new renal transplant patients shows an initial rise from 127 transplants per year in 1998 to a peak of 190 transplants in 2004. This is a rise of nearly 50% but the number declined subsequently to only 38 in 2007 (Table 14.1.1). This is due to reduction in the number of transplantations done in China. As renal transplantation in the country is still dependant on the availability of commercial cadaveric transplantation done abroad this drop was foreseeable. There may be an increase post 2008 Beijing Olympic Games and this is supported by 48 transplants in year 2008. The number of functioning renal transplants reported to the National Transplant Registry (NTR) had increased from 1178 in 1999 to 1730 in 2008 (Table 14.1.1).

**Table 14.1.1:** Stock and Flow of Renal Transplantation, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New transplant patients	127	143	163	172	160	190	162	141	100	88
Died	25	30	37	33	37	42	43	50	39	48
Graft failure	37	32	40	39	42	44	21	38	37	32
Lost to Follow up	1	9	3	5	4	14	10	10	18	10
Functioning graft at 31 <sup>st</sup> December	1178	1250	1333	1428	1505	1595	1683	1726	1732	1730

**Figure 14.1.1:** Stock and Flow of Renal Transplantation, 1975-2008

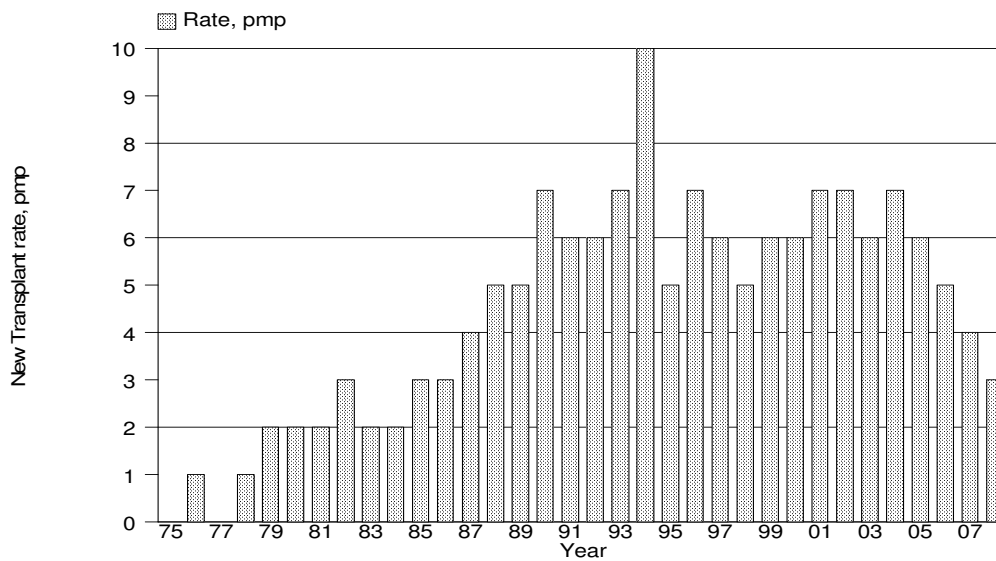


The incidence of renal transplantation stabilised at a modest rate of 5-7 per million population (Table 14.1.2) while transplant prevalence rate has grown slowly from 52 per million in 1999 to 64 per million population in 2007 (Table 14.1.3), an increase of 23% over the 1999 figures. However compared to growth in the prevalence rate of dialysis patients (which has increased by 300% from 205 in 1998 to 615 in 2007) our transplant prevalence rate has not kept up. In fact, the incidence rate and prevalence rate seem to reduce in year 2008 (3 and 62 per million population respectively (Table 14.1.2 and 14.1.3).

**Table 14.1.2:** New transplant rate per million population (pmp), 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New transplant patients	127	143	163	172	160	190	162	141	100	88
New transplant rate, pmp	6	6	7	7	6	7	6	5	4	3

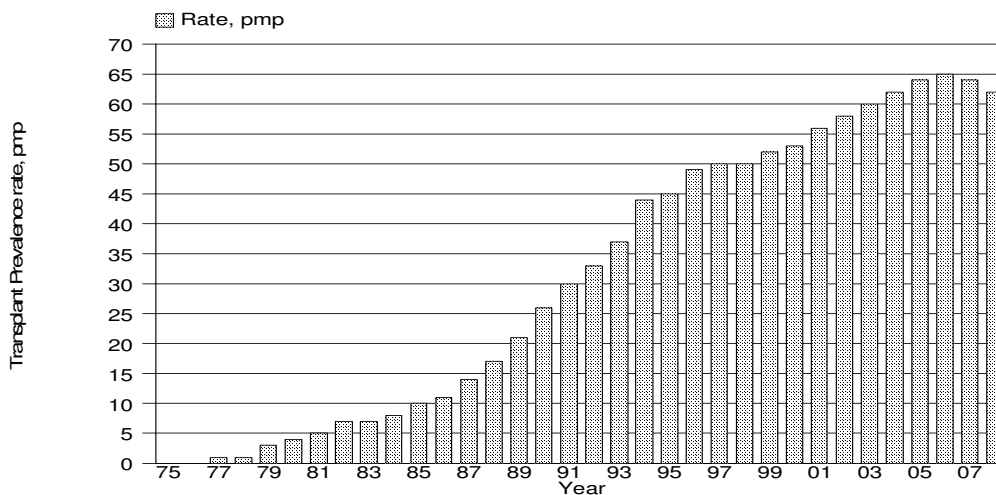
**Figure 14.1.2:** New transplant rate, 1975-2008



**Table 14.1.3:** Transplant prevalence rate per million population (pmp), 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Functioning graft at 31 <sup>st</sup> Dec	1178	1250	1333	1428	1505	1595	1683	1726	1732	1730
Transplant prevalence rate, pmp	52	53	56	58	60	62	64	65	64	62

**Figure 14.1.3:** Transplant prevalence rate, 1975-2008



**Table 14.1.4:** Place of transplantation, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	36	28	28	20	33	20	30	17	26	16
UMMC	16	13	19	13	23	14	15	9	6	4
Selayang Hospital	0	0	4	3	11	7	11	6	11	7
Other local	1	1	3	2	4	2	1	1	1	1
China	63	50	80	56	83	51	103	60	111	69
India	5	4	9	6	8	5	12	7	4	3
Other overseas	2	2	0	0	1	1	0	0	1	1
Unknown	4	3	0	0	0	0	0	0	0	0
TOTAL	127	100	143	100	163	100	172	100	160	100

Year	2004		2005		2006		2007		2008		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	20	11	31	19	35	25	36	36	32	36	307	21
UMMC	7	4	7	4	5	4	0	0	0	0	98	7
Selayang Hospital	11	6	5	3	9	6	14	14	7	8	83	6
Other local	2	1	5	3	2	1	3	3	7	8	29	2
China	137	72	108	67	81	57	41	41	41	47	848	59
India	11	6	5	3	7	5	1	1	1	1	63	4
Other overseas	2	1	1	1	2	1	5	5	0	0	14	1
Unknown	0	0	0	0	0	0	0	0	0	0	4	0
TOTAL	190	100	162	100	141	100	100	100	88	100	1446	100

In terms of place of transplantation, transplantation within local centres has remained the quite same from 1999 to 2007, with 52 to 53 cases (51% of all renal transplants), but has decreased to 46 in 2008. This is disturbing data as it underscores our failure to improve transplantation rates within the country which is mainly due to the lack of both living as well as cadaver donors. Transplantation in China in 2008 comprised 47% of all of renal transplant recipients with 41 patients.

## SECTION 14.2: RECIPIENTS' CHARACTERISTICS

In terms of renal transplant recipients' characteristics, age at transplant has been stable at 34 to 42 years. Between 58% and 70% of recipients were males over the last 10 years. There has been an increase in the proportion of diabetic patients undergoing transplantation from 11% in 1998 to 21% in 2006 (Table 14.2.1). However, there is a drastic drop in number of diabetic patients who underwent transplantation in 2007 and 2008 (14% and 15% respectively). This coincided with the drop in China transplants where the majority of the diabetic patients underwent their transplantation. Patients with hepatitis B and hepatitis C remained static at around 4-8%. In terms of cause of end stage renal failure (Table 14.2.2), the primary cause was still glomerulonephritis, followed by hypertension and diabetes as the third cause. Up to 40% of transplant recipients had end stage renal disease due to unknown causes, belying the fact that majority of these patients presented late.

**Table 14.2.1:** Renal Transplant Recipients' Characteristics, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New Transplant Patients	127	143	163	172	160	190	162	141	100	88
Age at transplant (years), Mean	37	39	41	41	42	41	38	37	36	34
Age at transplant (years), SD	13	14	13	13	13	13	14	15	16	15
% Male	62	64	63	58	66	62	70	67	63	58
% Diabetic (co-morbid/ primary renal disease)	11	15	18	15	22	22	20	21	14	15
% HBsAg positive	4	5	5	7	8	5	4	7	5	4
% Anti-HCV positive	11	8	15	8	10	8	2	8	10	4

**Table 14.2.2:** Primary causes of end stage renal failure, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	127	100	143	100	163	100	172	100	160	100
Glomerulonephritis	41	32	50	35	44	27	54	31	54	34
Diabetes Mellitus	10	8	16	11	23	14	16	9	26	16
Hypertension	7	6	20	14	17	10	24	14	25	16
Obstructive uropathy	4	3	3	2	3	2	2	1	2	1
ADPKD	1	1	3	2	1	1	3	2	5	3
Drugs/ toxic nephropathy	0	0	0	0	0	0	0	0	2	1
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0
Unknown	62	49	54	38	61	37	70	41	58	36
Others	6	5	12	8	23	14	16	9	12	8

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	190	100	162	100	141	100	100	100	88	100
Glomerulonephritis	62	33	44	27	52	37	29	29	21	24
Diabetes Mellitus	32	17	29	18	22	16	9	9	10	11
Hypertension	51	27	39	24	31	22	24	24	15	17
Obstructive uropathy	4	2	3	2	4	3	1	1	0	0
ADPKD	5	3	3	2	1	1	1	1	0	0
Drugs/ toxic nephropathy	2	1	0	0	1	1	0	0	2	2
Hereditary nephritis	1	1	0	0	0	0	0	0	0	0
Unknown	83	44	50	31	44	31	37	37	40	45
Others	27	14	17	10	16	11	14	14	12	14

**SECTION 14.3: TRANSPLANT PRACTICES**

In 2006, 62% of the renal transplant recipients received their grafts from commercial sources. Fifty-eight percent of these were from commercial cadavers. Live donor transplantation made up 20% of transplants (28 recipients) in the same year which was down from 45 cases (37%) in 1999 and 40 cases (24%) in 2005. Since 2006, the number of live donor has remained low - 31 in 2007 and 25 in 2008. Local cadaveric donation made up 18% of transplants (24 recipients) in 2006 although it had shown an initial promising rise to 37 recipients in 2001. 2007 marked the first time in 10 years where there were more local transplantations (57%) compared to commercial transplantations in oversea (41%).

**Table 14.3.1:** Type of Renal Transplantation, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial cadaver	64	52	80	56	83	51	103	60	112	70
Commercial live donor	4	3	9	6	7	4	11	6	3	2
Live donor (genetically related)	40	33	21	15	32	20	33	19	25	16
Live donor (emotionally related)	5	4	6	4	4	2	3	2	5	3
Cadaver	10	8	27	19	37	23	22	13	15	9
Total	123	100	143	100	163	100	172	100	160	100

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial cadaver	143	76	105	65	82	58	41	41	40	45
Commercial live donor	6	3	8	5	5	4	2	2	1	1
Live donor (genetically related)	21	11	37	23	24	17	20	20	22	25
Live donor (emotionally related)	2	1	3	1	4	3	11	12	3	4
Cadaver	17	9	9	6	26	18	25	25	22	25
Total	189	100	162	100	141	100	99	100	88	100

\*Commercial Cadaver (China, India, other oversea) \*Commercial live donor (living unrelated) \*Cadaver (local)

**Table 14.3.2:** Biochemical data, 2006-2008

Biochemical parameters	Summary	2006	2007	2008
Creatinine, umol/L	N	1592	1686	1499
	Mean	135.7	131.8	131
	SD	81.3	77.6	80.2
	Median	120	116	113
	Minimum	21.7	36	29
	Maximum	1152	1186	1181
Hb, g/dL	N	1592	1686	1499
	Mean	12.7	12.8	12.9
	SD	1.9	1.9	1.9
	Median	12.8	12.8	12.9
	Minimum	3.3	4.4	6.2
	Maximum	19.8	18.7	18.6
Albumin, g/L	N	1592	1686	1499
	Mean	40	40	40
	SD	0.7	0.8	0.8
	Median	40	40	40
	Minimum	29	29	30
	Maximum	48	48	50
Calcium, mmol/L	N	1592	1686	1499
	Mean	2.3	2.3	2.3
	SD	0.2	0.2	0.2
	Median	2.3	2.3	2.3
	Minimum	1.1	1.4	1
	Maximum	3.1	3.2	3.5

Biochemical parameters	Summary	2006	2007	2008
Phosphate, mmol/L	N	1592	1686	1499
	Mean	1.1	1.1	1.1
	SD	0.2	0.3	0.3
	Median	1.1	1.1	1.1
	Minimum	0.5	0.5	0.5
	Maximum	3.5	3.9	3.2
Alkaline Phosphate (ALP), U/L	N	1592	1686	1499
	Mean	79.1	79.4	78.4
	SD	43.2	39.8	47.9
	Median	71	72	70
	Minimum	24	22	20
	Maximum	700	508	985
ALT, U/L	N	1592	1686	1499
	Mean	29.8	29.8	28.6
	SD	30.4	25.7	31
	Median	22	23	22
	Minimum	4	4	4
	Maximum	433	356	733
Total cholesterol, mmol/L	N	1592	1686	1499
	Mean	5.3	5.2	5.2
	SD	1	1	1
	Median	5.3	5.3	5.3
	Minimum	1.5	1.7	2
	Maximum	11.1	11.4	11.2
LDL cholesterol, mmol/L	N	1592	1686	1499
	Mean	3	3	2.9
	SD	0.8	0.8	0.8
	Median	3	3	3
	Minimum	1	1	0.9
	Maximum	11.1	8.9	7.7
HDL cholesterol, mmol/L	N	1592	1686	1499
	Mean	1.6	1.5	1.6
	SD	0.5	0.4	0.5
	Median	1.6	1.6	1.6
	Minimum	0.4	0.4	0.5
	Maximum	5.8	7.5	7.5
Systolic Blood Pressure, mmHg	N	1592	1686	1499
	Mean	130.7	131.6	129.4
	SD	15.9	15.7	16.1
	Median	130	130	130
	Minimum	66	80	80
	Maximum	210	210	245
Diastolic Blood Pressure, mmHg	N	1592	1686	1499
	Mean	78.9	78.8	77.5
	SD	9.8	9.4	9.7
	Median	80	80	80
	Minimum	30	20	20
	Maximum	120	116	133

**Table 14.3.3:** Medication data, 2006-2008

Medication data	Single drug treatment						Combined drug treatment					
	2006		2007		2008		2006		2007		2008	
	N	%	N	%	N	%	N	%	N	%	N	%
All	1482	100	1664	100	1359	100	1482	100	1664	100	1359	100
(i) Immunosuppressive drug(s) treatment												
Prednisolone	8	1	9	1	6	0	1444	97	1610	97	1321	97
Azathioprine	0	0	0	0	0	0	497	34	479	29	374	28
Cyclosporin A	5	0	8	0	2	0	1119	76	1190	72	938	69
Tacrolimus (FK506)	0	0	4	0	3	0	254	17	348	21	327	24
Mycophenolate Mofetil (MMF)	0	0	1	0	2	0	708	48	906	54	721	53
Rapamycin	0	0	0	0	1	0	7	0	33	2	30	2
Others	0	0	0	0	0	0	18	1	4	0	1	0
(ii) Non-Immunosuppressive drug(s) treatment												
Beta blocker	77	5	90	5	87	6	597	40	735	44	609	45
Calcium channel blocker	199	13	184	11	137	10	787	53	904	54	680	50
ACE inhibitor	39	3	38	2	29	2	292	20	384	23	282	21
AIIRB	27	2	18	1	17	1	141	10	210	13	137	10
Anti-lipid	156	11	95	6	87	6	679	46	731	44	616	45
Other anti-hypertensive	11	1	6	0	24	2	159	11	140	8	188	14

In 2008, Cyclosporine based regimes remained the mainstay of immunosuppressive therapy with 69% of patients receiving it. This showed a gradual declining trend from 80% of all immunosuppression used since 2004 which coincided with increasing trend in Tacrolimus usage. Tacrolimus based regimes accounted for 24%. There has been continuous increase in the use of Mycophenolate Mofetil as the second immunosuppressive agent in 53% of patients in 2008 compared to 37% of patients in 2004. During the same period, the use of Azathioprine declined from 43% in 2004 to 28% in 2008. Monotherapy of immunosuppression is mostly not noted except in a small number of patients. Sirolimus was used in 2% of all transplant recipients in 2008.

In terms of non immunosuppressive medications, in year 2008 only 31% of patients were on ACE inhibitors or Angiotensin II receptor blockers (AIIRB) or both and this trend has been relatively static since 2004. Calcium Channel blockers appeared to be the mainstay of antihypertensive therapy in 50% of patients whilst Beta Blockers use was reported in 45% of patients. Other antihypertensives were reported in 14% of patients. The widespread use of Calcium Channel blockers either as monotherapy or combination may be due to the use of the dihydropyridine group to minimise the dose of Cyclosporine, which remains the main immunosuppressive drug.



## SECTION 14.4: TRANSPLANT OUTCOMES

### 14.4.1 Post-transplant complications

In the year 2008, sixty-two percent of patients were hypertensive prior to transplantation whereas 27% developed hypertension post transplantation. Fourteen percent of patients had diabetes mellitus prior to transplant whereas only 7% of patients developed post transplant diabetes mellitus. These trends have been quite the same since 2006. In terms of cardiovascular and cerebrovascular disease 4% had either or both prior to transplant whereas 5% developed these post transplantation.

**Table 14.4.1:** Post-transplant complications, 2006-2008

Post transplant complications	Complication developed before transplant (regardless of complication after transplantation)						Complication developed only after transplantation					
	2006		2007		2008		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
All patients	1592	100	1686	100	1499	100	1592	100	1686	100	1499	100
Diabetes (either as Primary Renal Disease or co-morbid)	216	14	230	14	204	14	125	8	112	7	112	7
Cancer	2	0	3	0	2	0	20	1	21	1	26	2
Cardiovascular disease + cerebrovascular disorder	73	5	72	4	61	4	45	3	54	3	70	5
Hypertension	1035	65	1062	63	927	62	354	22	450	27	400	27

\*Hypertension: BP systolic >140 and BP diastolic >90  
OR have either Beta blocker/ Calcium channel blocker / ACE inhibitor / AIIRB / Other anti-hypertensive

### 14.4.2 Deaths and Graft loss

In 2008, 48 transplant recipients died and 32 lost their grafts. The rates of transplant death and graft loss have remained static for the past 10 years (Table 14.4.2). The main known causes of death have been infection and cardiovascular disease with 26% and 13% respectively. Another 23% of patients died at home, which is usually presumed to be cardiovascular death as well.

Cancer death rates have been significantly high since 2003 contributing to 15% of all deaths in 2003, 17% in 2004 and 19% in 2008. Death due to liver disease has remained relatively static at 5-9% from 2003 to 2006.

In terms of graft loss, 72% were due to rejection with 6% apiece for vascular causes and infections in 2008 and these figures have remained relatively stable for the last 4 years.

**Table 14.4.2:** Transplant Patients Death Rate and Graft Loss, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. at risk	1145	1213	1291	1380	1466	1549	1638	1704	1728	1730
Transplant death	25	30	37	33	37	42	43	50	39	48
Transplant death rate %	2	2	3	2	3	3	3	3	2	3
Graft loss	37	32	40	39	42	44	21	38	37	32
Graft loss rate %	3	3	3	3	3	3	1	2	2	2
Acute rejection	0	0	0	0	3	19	14	18	12	0
Acute rejection rate %	0	0	0	0	0	1	1	1	1	0
All losses	62	62	77	72	79	86	64	88	76	80
All losses rate %	5	5	6	5	5	6	4	5	4	5

\*Graft loss=graft failure

\*All losses=death / graft loss (acute rejection happens concurrently with graft failure / death)

Figure 14.4.2(a): Transplant Recipient Death Rate, 1977-2008

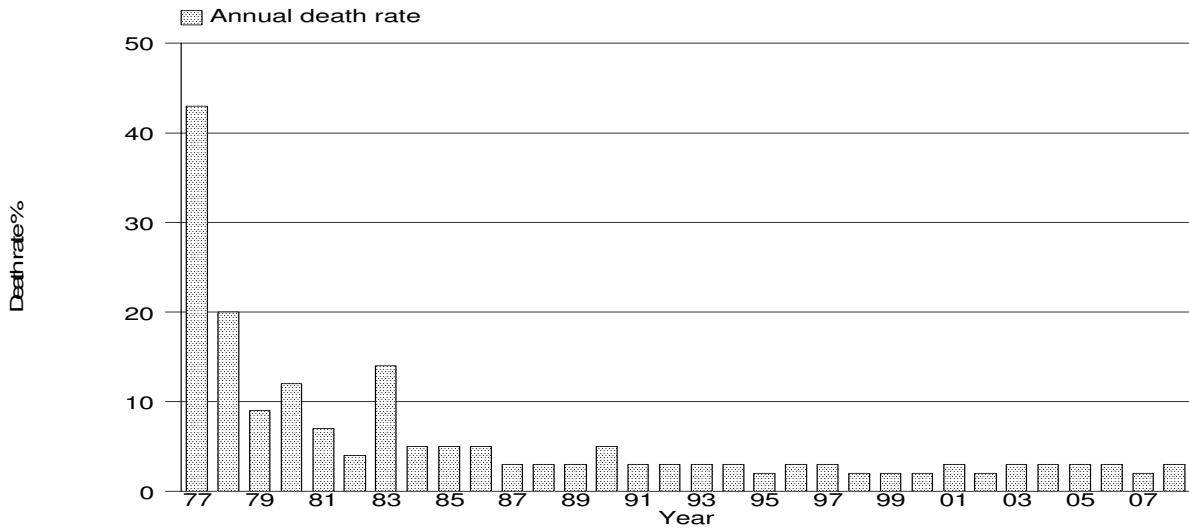
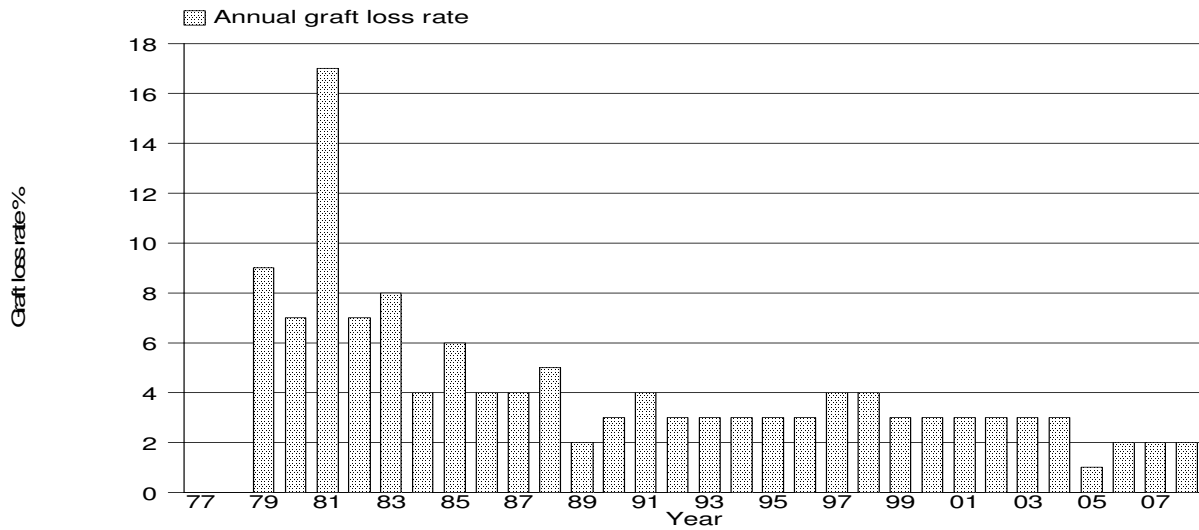


Figure 14.4.2(b): Transplant Recipient Graft Loss Rate, 1977-2008



**Table 14.4.3:** Causes of Death in Transplant Recipients, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	4	13	10	29	7	16	5	15	9	23
Died at home	6	19	1	3	5	12	5	15	5	13
Infection	7	23	12	35	20	47	10	30	11	28
Graft failure	0	0	2	6	0	0	0	0	0	0
Cancer	3	10	2	6	6	14	4	12	6	15
Liver disease	3	10	1	3	1	2	3	9	2	5
Accidental death	1	3	1	3	1	2	1	3	0	0
Others	5	16	3	9	2	5	3	9	5	13
Unknown	2	6	2	6	1	2	2	6	2	5
<b>TOTAL</b>	<b>31</b>	<b>100</b>	<b>34</b>	<b>100</b>	<b>43</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>40</b>	<b>100</b>

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	4	9	5	11	10	18	7	16	7	13
Died at home	6	13	5	11	7	13	5	11	12	23
Infection	11	24	22	50	22	40	15	34	14	26
Graft failure	3	7	0	0	0	0	4	9	1	2
Cancer	8	17	5	11	4	7	6	14	10	19
Liver disease	3	7	3	7	5	9	0	0	0	0
Accidental death	0	0	0	0	0	0	0	0	0	0
Others	10	22	3	7	4	7	3	7	8	15
Unknown	1	2	1	2	3	5	4	9	1	2
<b>TOTAL</b>	<b>46</b>	<b>100</b>	<b>44</b>	<b>100</b>	<b>55</b>	<b>100</b>	<b>44</b>	<b>100</b>	<b>53</b>	<b>100</b>

**Table 14.4.4:** Causes of Graft Failure, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Rejection	23	62	19	59	25	61	23	56	21	47
Calcineurin toxicity	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0	0	0	0	0	0	0	0	0	0
Ureteric obstruction	0	0	0	0	0	0	0	0	0	0
Infection	0	0	1	3	2	5	0	0	2	4
Vascular causes	1	3	3	9	1	2	0	0	3	7
Recurrent/ de novo renal disease	0	0	0	0	2	5	2	5	2	4
Others	0	0	2	6	0	0	4	10	1	2
Unknown	13	35	7	22	11	27	12	29	16	36
<b>TOTAL</b>	<b>37</b>	<b>100</b>	<b>32</b>	<b>100</b>	<b>41</b>	<b>100</b>	<b>41</b>	<b>100</b>	<b>45</b>	<b>100</b>

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Rejection	33	70	18	75	28	65	26	68	26	72
Calcineurin toxicity	0	0	0	0	1	2	0	0	0	0
Other drug toxicity	1	2	0	0	0	0	0	0	0	0
Ureteric obstruction	0	0	0	0	0	0	1	3	0	0
Infection	1	2	1	4	3	7	1	3	2	6
Vascular causes	4	9	2	8	4	9	1	3	2	6
Recurrent/ de novo renal disease	1	2	0	0	1	2	0	0	0	0
Others	0	0	1	4	3	7	4	11	2	6
Unknown	7	15	2	8	3	7	5	13	4	11
<b>TOTAL</b>	<b>47</b>	<b>100</b>	<b>24</b>	<b>100</b>	<b>43</b>	<b>100</b>	<b>38</b>	<b>100</b>	<b>36</b>	<b>100</b>

**14.5: PATIENT AND GRAFT SURVIVAL**

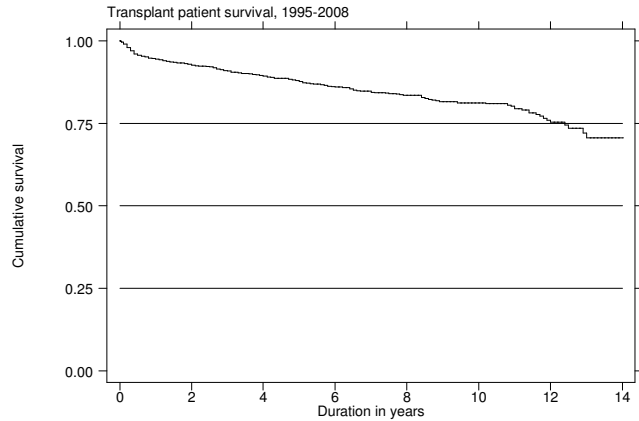
Overall patient survival rates from 1995 to 2008 have been 95%, 91%, 88% and 81% at year 1, 3, 5 and 10 respectively. Overall graft survival rate has been 91%, 85%, 80% and 66% at year 1, 3, 5 and 10 respectively.

**Table 14.5.1:** Patient survival, 1995-2008

Interval (years)	No.	% Survival	SE
0	1925	100	-
1	1689	95	1
3	1351	91	1
5	971	88	1
10	296	81	1
12	125	75	2

\*No.=Number at risk                      SE=standard error

**Figure 14.5.1:** Patient survival, 1995-2008

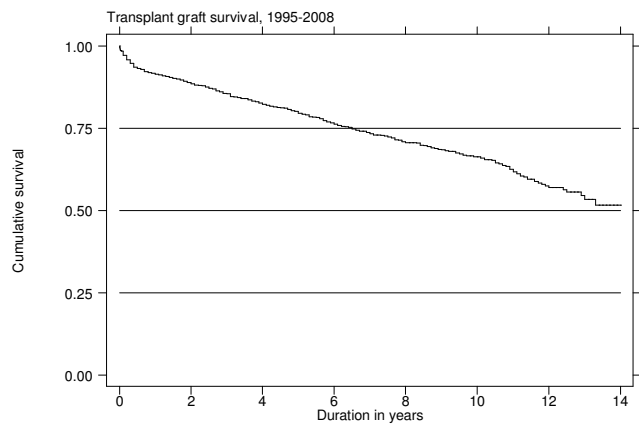


**Table 14.5.2:** Graft survival, 1995-2008

Interval (years)	No.	% Survival	SE
0	1925	100	-
1	1689	91	1
3	1351	85	1
5	971	80	1
10	296	66	1
12	125	57	2

\*No.=Number at risk                      SE=standard error

**Figure 14.5.2:** Graft survival, 1995-2008



Outcomes of renal transplantation from the 4 donor groups are shown in respect to patient and graft survival in the Kaplan Meier survival graphs in Figures 14.5.3 and 14.5.4 respectively. In terms of patient survival, live donor grafts maintained good survival rates with 96%, 95%, 94% and 89% at years 1, 3, 5 and 10 respectively. In terms of graft survival, commercial cadaver grafts performed similarly well with a survival of 94%, 89%, 82% and 70% at year 1, 3, 5 and 10 compared to 92%, 88%, 84% and 68% for the same intervals for live donor grafts.

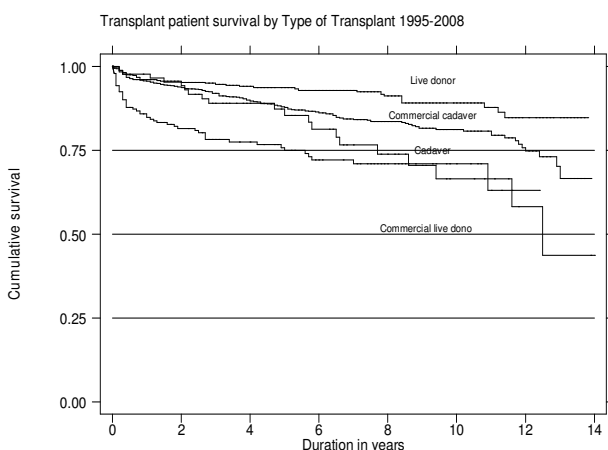
**Table 14.5.3:** Patient survival by type of transplant, 1995-2008

Type of Transplant Interval (years)	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
0	1125	100	-	89	100	-	454	100	-	235	100	-
1	1022	96	1	85	98	2	395	96	1	168	85	2
3	843	92	1	64	89	3	320	95	1	110	78	3
5	576	88	1	46	85	4	249	94	1	90	75	3
10	177	81	2	16	67	7	83	89	2	15	71	4
12	74	75	3	5	58	10	44	85	3	4	63	8

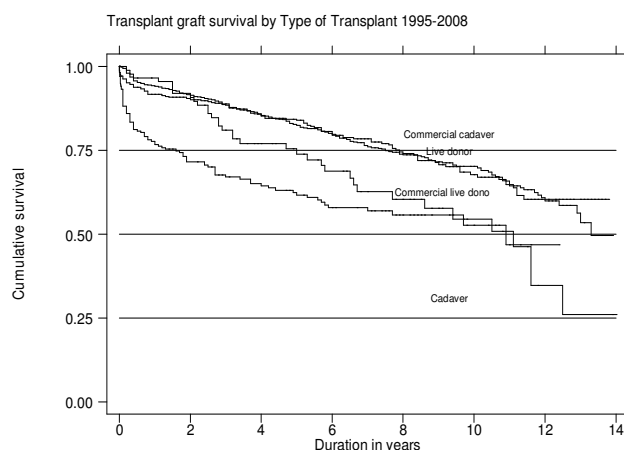
\*No.=Number at risk

SE=standard error

**Figure 14.5.3:** Patient survival by type of transplant, 1995-2008



**Figure 14.5.4:** Graft survival by type of transplants, 1995-2008



**Table 14.5.4:** Graft survival by type of transplant, 1995-2008

Type of Transplant Interval (years)	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
0	1125	100	-	89	100	-	454	100	-	235	100	-
1	1022	94	1	85	97	2	395	92	1	168	77	3
3	843	89	1	64	81	4	320	88	2	110	67	3
5	576	82	1	46	74	5	249	84	2	90	62	3
10	177	70	2	16	54	7	83	68	3	15	53	5
12	74	60	3	5	35	9	44	60	4	4	47	7

\*No.=Number at risk

SE=standard error

Patient and graft survival for living related transplants were compared for two cohorts. The 1995-2000 cohort and the 2001-2008 cohort were compared for patient survival (Figures 14.5.5) but both were comparable and survival remained excellent for both groups.

Graft survival for living related transplants (Figure 14.5.6) however was much better in patients in the 2001-2008 cohort even from the outset probably due to increased usage of newer immunosuppressive agents.

**Table 14.5.5:** Patient survival by year of transplant (Living related transplant, 1995-2008)

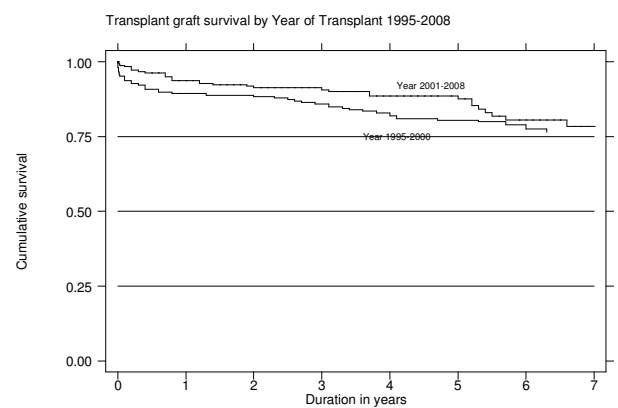
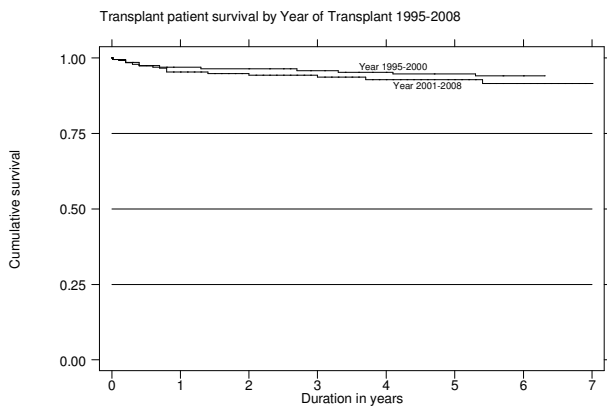
Year of Transplant Interval (years)	1995-2000			2001-2008		
	No.	% Survival	SE	No.	% Survival	SE
0	206	100	-	248	100	-
1	184	97	1	212	95	1
3	175	96	1	146	94	2
5	164	95	2	86	93	2
7	155	94	2	27	92	2

\*No.=Number at risk

SE=standard error

**Figure 14.5.5:** Patient survival by year of transplant (Living related transplant, 1995-2008)

**Figure 14.5.6:** Graft survival by year of transplant (Living related transplant, 1995-2008)



**Table 14.5.6:** Graft survival by year of transplant (Living related transplant, 1995-2008)

Year of Transplant Interval (years)	1994-1999			2000-2007		
	No.	% Survival	SE	No.	% Survival	SE
0	206	100	-	248	100	-
1	184	89	2	212	94	2
3	175	86	2	146	91	2
5	164	80	3	86	87	2
7	155	76	3	27	78	4

\*No.=Number at risk

SE=standard error

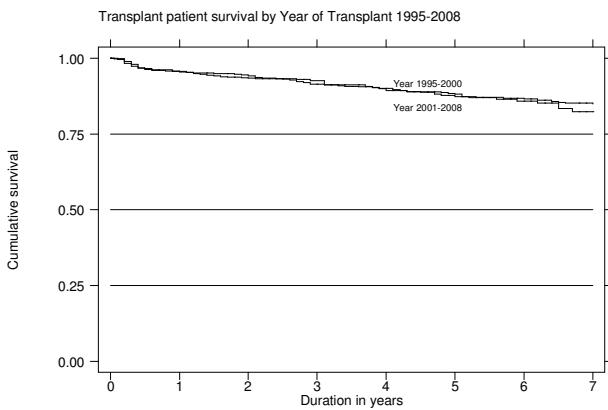
In terms of commercial cadaveric transplantation, the comparison between the 1995-2000 cohort and 2001 – 2008 cohort was performed. Both patient and graft survival showed comparable results to living related transplants done within the country.

**Table 14.5.7:** Patient survival by year of transplant (Commercial cadaver transplant, 1995-2008)

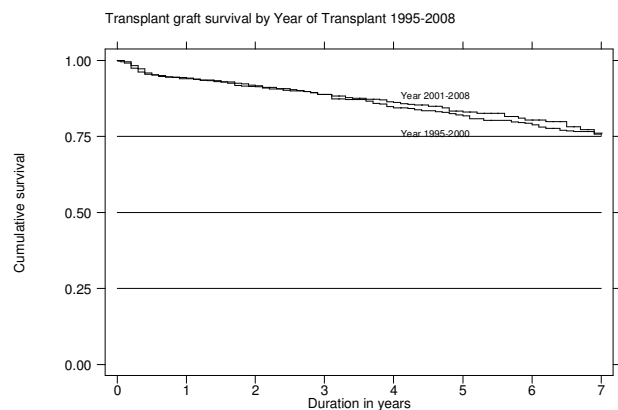
Year of Transplant Interval (years)	1995-2000			2001-2008		
	No.	% Survival	SE	No.	% Survival	SE
0	417	100	-	708	100	-
1	394	96	1	630	95	1
3	373	93	1	473	91	1
5	336	88	2	240	87	1
7	305	85	2	57	82	2

\*No.=Number at risk SE=standard error

**Figure 14.5.7:** Patient survival by year of transplant (Commercial cadaver transplant, 1995-2008)



**Figure 14.5.8:** Graft survival by year of transplant (Commercial cadaver transplant, 1995-2008)



**Table 14.5.8:** Graft survival by year of transplant (Commercial cadaver transplant, 1995-2008)

Year of Transplant Interval (years)	1995-2000			2001-2008		
	No.	% Survival	SE	No.	% Survival	SE
0	417	100	-	708	100	-
1	394	94	1	630	94	1
3	373	89	2	473	89	1
5	336	82	2	240	83	2
7	305	75	2	57	76	3

\*No.=Number at risk SE=standard error

**SECTION 14.6: CARDIOVASCULAR RISK IN RENAL TRANSPLANT RECIPIENTS**

**14.6.1 Risk factors for ischaemic heart disease**

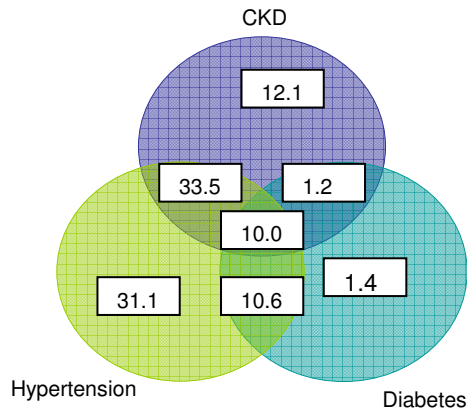
In 2008, 85.2% of patients were hypertensive, 23.2% were diabetic and 56.8% had renal insufficiency fulfilling CKD III and above. Forty-five percent of patients had 2 cardiovascular risk factors while 10% had all 3 major risk factors.

**Table 14.6.1:** Risk factors for IHD in renal transplant recipients at year 2006, 2007 and 2008

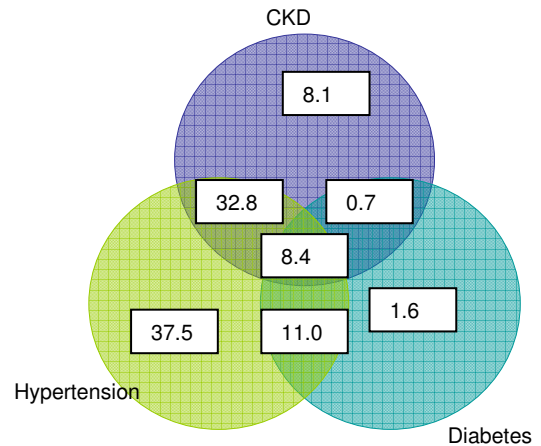
	2006	2007	2008
Diabetes	21 (1.4)	25 (1.6)	17 (1.2)
Hypertension**	455 (31.1)	590 (37.5)	514 (36.8)
CKD	177 (12.1)	127 (8.1)	116 (8.3)
Diabetes + Hypertension**	155 (10.6)	174 (11.0)	172 (12.3)
Diabetes + CKD	18 (1.2)	11 (0.7)	21 (1.5)
CKD + Hypertension**	490 (33.5)	516 (32.8)	451 (32.3)
Diabetes + CKD + Hypertension**	147 (10.0)	132 (8.4)	106 (7.6)

\*\*Hypertension: BP systolic > 140 and BP diastolic > 90 OR have either Beta blocker / Calcium channel blocker / ACE inhibitor / AIIIRB / Other anti-hypertensive drugs  
 GFR (mL/min/1.73m2) = 1.2\*(140-age(year))\*weight(kg) / creatinine (µmol/L) if male  
 GFR (mL/min/1.73m2) = 0.85\*(1.2\*(140-age(year))\*weight(kg) / creatinine (µmol/L) if female  
 CKD stage III-GFR, 30-60  
 CKD stage IV-GFR, 15-30  
 CKD stage V-GFR, <15

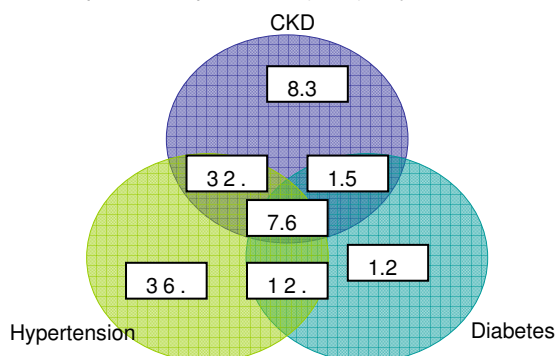
**Figure 14.6.1(a);** Venn Diagram for Pre and Post Transplant Complications (in %) at year 2006



**Figure 14.6.1(b);** Venn Diagram for Pre and Post Transplant Complications (in %) at year 2007



**Figure 14.6.1 (c);** Venn Diagram for Pre and Post Transplant Complications (in %) at year 2008





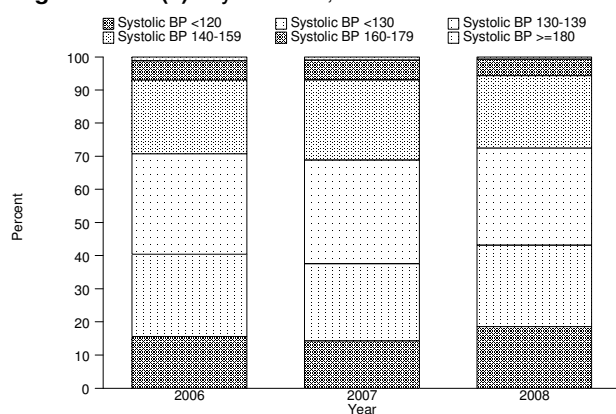
**14.6.2 Blood Pressure classification according to JNC VI criteria, 2006, 2007, and 2008**

In 2008, 22% of renal transplant recipients had stage I hypertension whereas 5% had stage II hypertension and 0.7% had stage III hypertension despite being on treatment. In terms of diastolic hypertension 13% had stage I hypertension, 1.4% of patients had stage II diastolic hypertension and 0.33% of patients had stage III diastolic hypertension despite being on treatment.

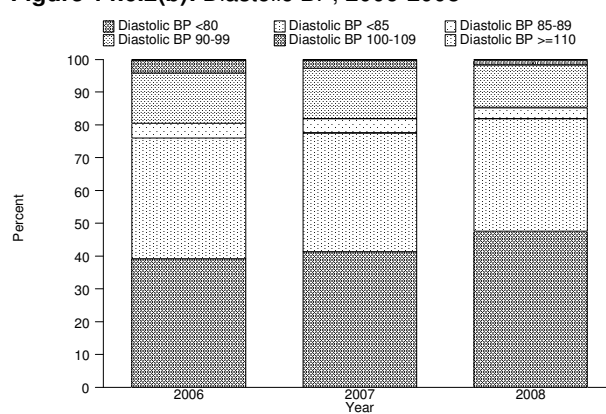
**Table 14.6.2(a): Systolic BP, 2006-2008**

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Systolic BP <120	249	(15.64)	240	(14.23)	279	(18.61)
Systolic BP <130	395	(24.81)	392	(23.25)	367	(24.48)
Systolic BP 130-139	483	(30.34)	529	(31.38)	441	(29.42)
Systolic BP 140-159	353	(22.17)	409	(24.26)	329	(21.95)
Systolic BP 160-179	93	(5.84)	99	(5.87)	73	(4.87)
Systolic BP >=180	19	(1.19)	17	(1.01)	10	(0.67)

**Figure 14.6.2(a): Systolic BP, 2006-2008**



**Figure 14.6.2(b): Diastolic BP, 2006-2008**



**Table 14.6.2(b): Diastolic BP, 2006-2008**

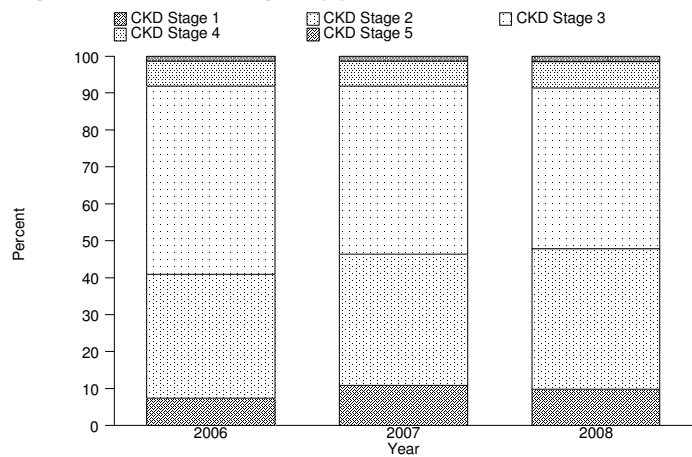
Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Diastolic BP <80	624	(39.20)	698	(41.40)	714	(47.63)
Diastolic BP <85	586	(36.81)	609	(36.12)	514	(34.29)
Diastolic BP 85-89	73	(4.59)	74	(4.39)	50	(3.34)
Diastolic BP 90-99	244	(15.33)	261	(15.48)	195	(13.01)
Diastolic BP 100-109	61	(3.83)	39	(2.31)	21	(1.40)
Diastolic BP >=110	4	(0.25)	5	(0.30)	5	(0.33)

**Table 14.6.3:** CKD stages, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
CKD stage 1	116	(7.33)	180	(10.79)	145	(9.82)
CKD stage 2	533	(33.67)	592	(35.49)	561	(37.98)
CKD stage 3	805	(50.85)	760	(45.56)	642	(43.47)
CKD stage 4	107	(6.76)	113	(6.77)	106	(7.18)
CKD stage 5	22	(1.39)	23	(1.38)	23	(1.56)

Table 14.6.3 shows the CKD Stage classification by year and in 2008, 43.5% of renal transplant recipients had CKD Stage III whilst another 7.2% had CKD Stage IV. CKD Stage V (impending renal replacement therapy) was found in 1.6% of renal transplant recipients.

**Figure 14.6.3:** CKD stages by year

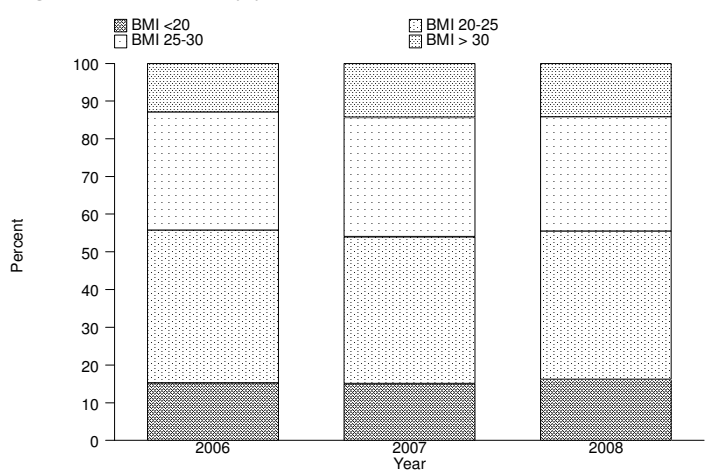


**Table 14.6.4:** BMI, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
BMI <20	242	(15.20)	253	(15.01)	244	(16.28)
BMI 20-25	647	(40.64)	658	(39.03)	588	(39.23)
BMI 25-30	498	(31.28)	533	(31.61)	455	(30.35)
BMI > 30	205	(12.88)	242	(14.35)	212	(14.14)

In terms of BMI for 2008, 55.5% of renal transplant recipients had BMIs of 25 or below. However 30.1% were overweight and another 14% were obese. There seems to be a slow but steady increase in numbers of obese patients over the last few years.

**Figure 14.6.4:** BMI by year

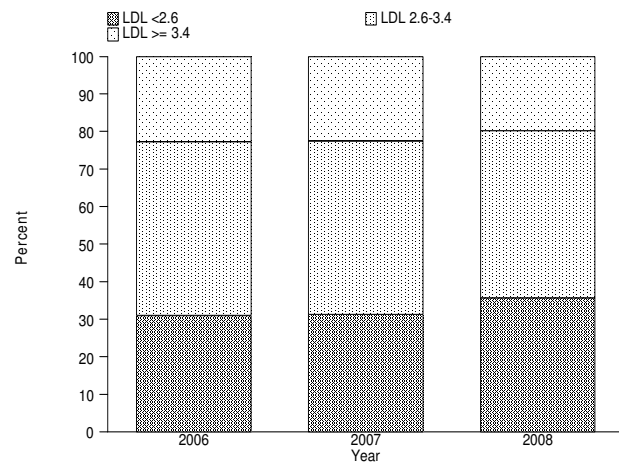


**Table 14.6.5(a): LDL, 2006-2008**

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
LDL < 2.6	492	(30.90)	527	(31.26)	534	(35.62)
LDL 2.6-3.4	738	(46.36)	778	(46.14)	669	(44.63)
LDL >= 3.4	362	(22.74)	381	(22.60)	296	(19.75)

LDL cholesterol has been identified as the primary lipid target for prevention of coronary heart disease by NCEP with a log linear relationship between risk of CHD and level of LDL cholesterol. In terms of renal transplant recipients in 2008 35.6% have LDL levels below 2.6 mol/l and this shows an increasing trend from 18.1% in 2004, possibly due to the more widespread and aggressive use of statins. Whether or not this translates into less cardiovascular mortality in the transplant population is still questionable. Patients with serum LDL >3.4 also demonstrated downward trend over the last few years.

**Figure 14.6.5(a): LDL, 2006-2008**

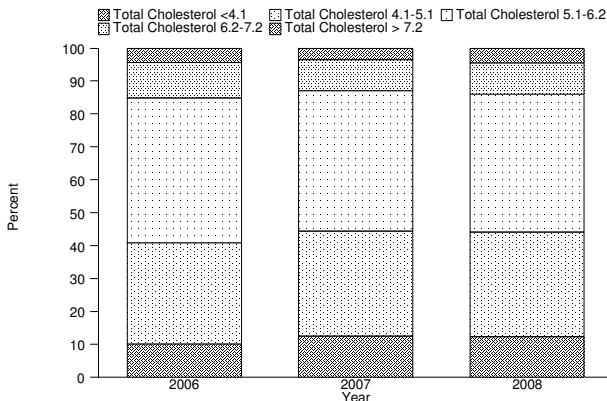


In terms of other cholesterol parameters for 2008, 56% had total cholesterol levels >= 5.2 and 6.2% had HDL cholesterol levels <1.0 .

**Table 14.6.5(b): Total Cholesterol, 2006-2008**

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Total Cholesterol <4.1	160	(10.05)	210	(12.46)	184	(12.27)
Total Cholesterol 4.1-5.1	490	(30.78)	539	(31.97)	476	(31.75)
Total Cholesterol 5.1-6.2	700	(43.97)	719	(42.65)	629	(41.96)
Total Cholesterol 6.2- 7.2	173	(10.87)	159	(9.43)	143	(9.54)
Total Cholesterol > 7.2	69	(4.33)	59	(3.50)	67	(4.47)

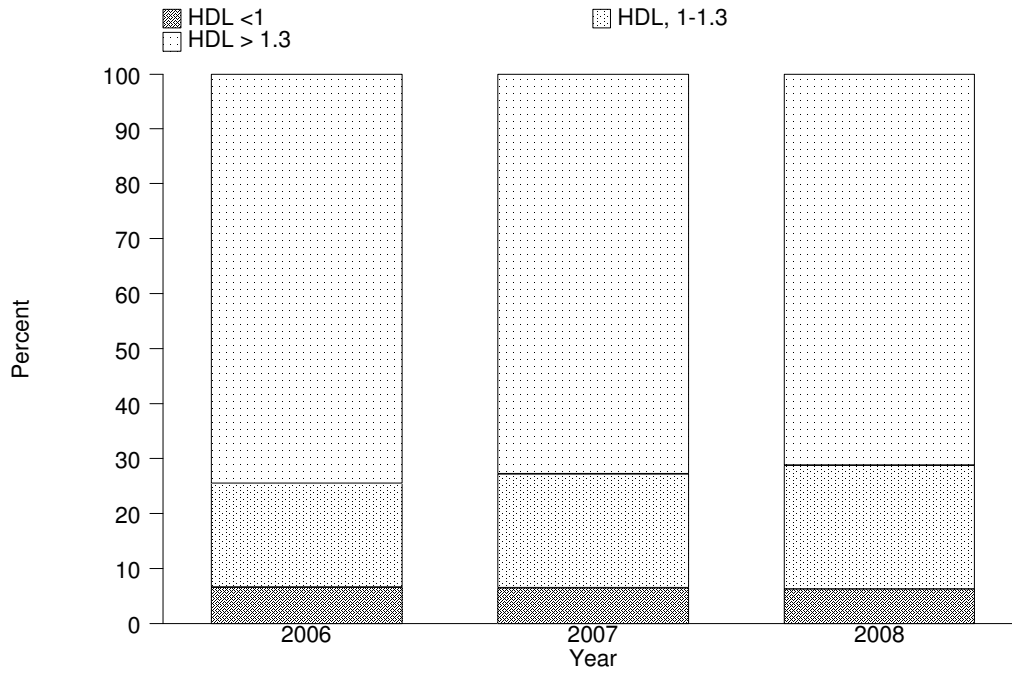
**Figure 14.6.5(b): Total Cholesterol, 2006-2008**



**Table 14.6.5(c): HDL, 2006-2008**

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
HDL <1	104	(6.53)	108	(6.41)	93	(6.20)
HDL 1-1.3	302	(18.97)	350	(20.76)	338	(22.55)
HDL >1.3	1186	(74.50)	1228	(72.84)	1068	(71.25)

**Figure 14.6.5(c): HDL by year**



Eighty-six percent of patients in 2008 were on antihypertensives and the majority were on more than 1 antihypertensive drug with 31% on 2 antihypertensives and 21% on 3 antihypertensives. Six percent of patients still had systolic BP of > 160 mmHg and 17% had diastolic BP of > 90 mmHg despite being given antihypertensive(s), however, this is an improvement from previous years.

**Table 14.6.6(a):** Treatment for hypertension, 2006-2008

Year	No.	% on anti-hypertensives	% no 1 anti-hypertensive drug	% on 2 anti-hypertensives	% on 3 anti-hypertensives
2006	1592	86	34	26	17
2007	1686	85	25	31	21
2008	1499	86	27	31	21

**Table 14.6.6(b):** Distribution of Systolic BP without anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 160mmHg
2006	189	123.8	14.4	120	117	130	4
2007	196	125.2	16.5	120	113	134	4
2008	171	124	15.6	120	110	130	4

**Table 14.6.6(c):** Distribution of Diastolic BP without anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% patients ≥ 90mmHg
2006	189	76.4	10.3	80	70	80	11
2007	196	76.6	10	80	70	80	12
2008	170	75.2	10.2	80	70	80	11

**Table 14.6.6(d):** Distribution of Systolic BP on anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 160mmHg
2006	1334	131.7	16.3	130	120	140	8
2007	1388	132.6	16	130	120	140	8
2008	1241	129.9	16.6	130	120	140	6

**Table 14.6.6(e):** Distribution of Diastolic BP on anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 90 mmHg
2006	1334	79.2	9.9	80	70	86	22
2007	1387	79.1	9.6	80	70	85	20
2008	1227	77.6	9.9	80	70	80	17

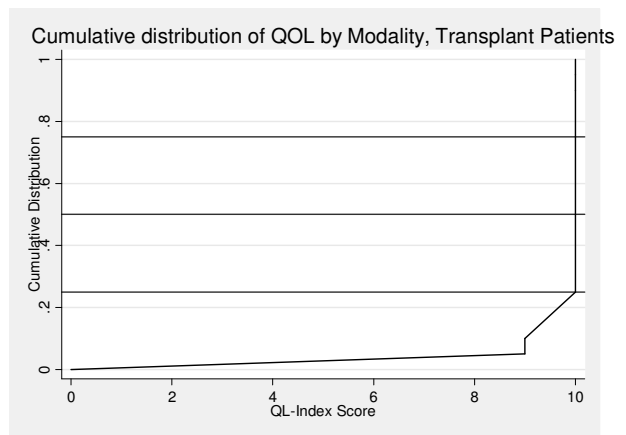
**SECTION 14.7: QOL INDEX SCORE IN RENAL TRANSPLANT RECIPIENTS**

1179 patients who were transplanted between 1999-2008 were analysed for QoL index score. They reported median QoL index score of 10 (Table 14.7.1 and Figure 14.7.1). It was interesting to note that for those who underwent renal transplantation between this period, diabetics and non-diabetics had the same median QoL index score of 10 (Table 14.7.2 and Figure 14.7.2), and this is in contrast to HD and CAPD patients where diabetics reported lower QoL index score than non-diabetics. There was also no difference seen between gender (Table 14.7.3 and Figure 14.7.3) and age (Table 14.7.4 and Figure 14.7.4). It is worth while to note that those above 60 year-old also enjoyed the same QoL index score (10) as their younger counterpart (Table 14.7.4 and Figure 14.7.4). This trend of high QoL index score among renal transplant patients was maintained over the last 10 years (Table 14.7.5 and Figure 14.7.5).

**Table 14.7.1:** Cumulative distribution of QoL-Index score in Transplant recipients 1999 - 2008

	QoL score
Number of patients	1179
Centile	
0	0
0.05	9
0.1	9
0.25 (LQ)	10
0.5 (median)	10
0.75 (UQ)	10
0.9	10
0.95	10
1	10

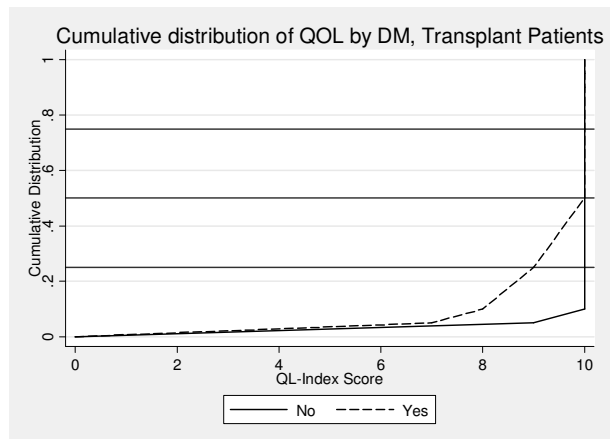
**Figure 14.7.1:** Cumulative distribution of QoL-Index score in Transplant recipients, 1999 - 2008



**Table 14.7.2:** Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipients 1999 - 2008

Diabetes mellitus	No	Yes
Number of patients	1054	125
Centile		
0	0	0
0.05	9	7
0.1	10	8
0.25 (LQ)	10	9
0.5 (median)	10	10
0.75 (UQ)	10	10
0.9	10	10
0.95	10	10
1	10	10

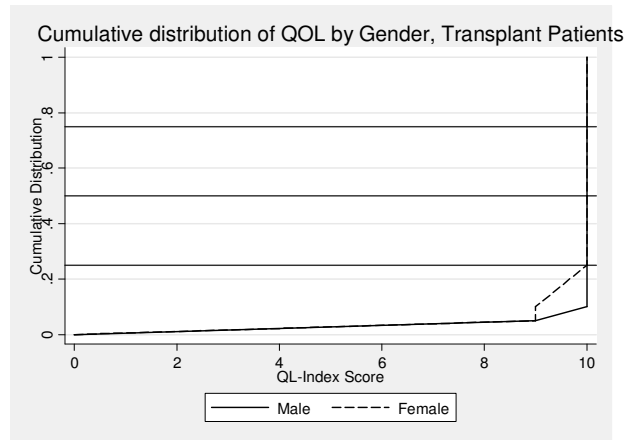
**Figure 14.7.2:** Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipients 1999 - 2008



**Table 14.7.3:** Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipients 1999-2008

Gender	Male	Female
Number of patients	730	449
Centile		
0	0	0
0.05	9	9
0.1	10	9
0.25 (LQ)	10	10
0.5 (median)	10	10
0.75 (UQ)	10	10
0.9	10	10
0.95	10	10
1	10	10

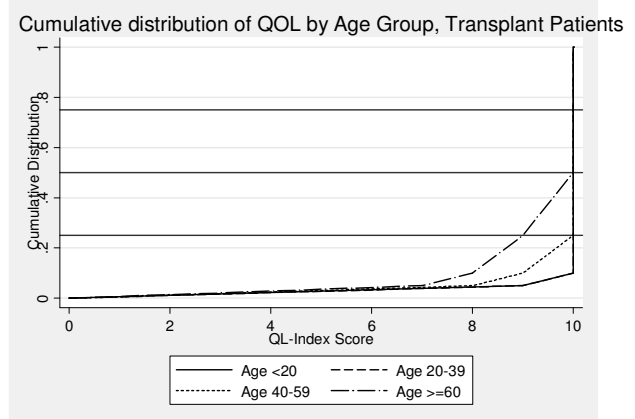
**Figure 14.7.3:** Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipients 1999 – 2008



**Table 14.7.4:** Cumulative distribution of QoL-Index score in relation to Age, Transplant recipients 1999-2008

Age group (years)	<20	20-39	40-59	≥60
Number of patients	117	472	515	75
Centile				
0	0	0	0	0
0.05	9	9	8	7
0.1	10	10	9	8
0.25 (LQ)	10	10	10	9
0.5 (median)	10	10	10	10
0.75 (UQ)	10	10	10	10
0.9	10	10	10	10
0.95	10	10	10	10
1	10	10	10	10

**Figure 14.7.4:** Cumulative distribution of QoL-Index score in relation to Age, Transplant recipients 1999-2008



**Table 14.7.5:** Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipients 1999-2008

Year of Entry	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of patients	101	110	126	143	136	167	137	128	76	55
Centile										
0	0	0	0	0	0	0	0	0	0	0
0.05	9	8	9	9	8	9	9	9	7	6
0.1	10	9	9	10	9	10	10	10	9	8
0.25 (LQ)	10	10	10	10	10	10	10	10	10	10
0.5 (median)	10	10	10	10	10	10	10	10	10	10
0.75 (UQ)	10	10	10	10	10	10	10	10	10	10
0.9	10	10	10	10	10	10	10	10	10	10
0.95	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10

**Figure 14.7.5:** Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipients 1999 – 2008

Cumulative distribution of QOL by Year of Entry, Transplant Patients

