

SINGAPORE RENAL REGISTRY REPORT NO. 9

# TRENDS IN CHRONIC KIDNEY FAILURE IN SINGAPORE 2010 – 2011

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# **FOREWORD**

The Singapore Renal Registry has been working very hard to put together data on kidney disease in Singapore in the past years. The data fulfil a very important function in providing insight and understanding of the trends and pattern of kidney disease in Singapore, particular chronic kidney failure, dialysis and renal transplantation.

This report would not have been possible without the support of many people and organisations, who have submitted, collected, analysed the data, prepared report and provided guidance. I am grateful to those who have worked hard and long on this report.

There have been many improvements made in this report. Trends on chronic kidney disease stage 5, mineral metabolism and nutrition have been added. I am confident that more improvements and refinements will be made with future reports.

I am sure that the report will be invaluable to those who are involved in the care of patients suffering from chronic kidney disease.

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Chairman Singapore Renal Registry

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We will like to acknowledge the Ministry of Health for kindly vetting the report.

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# 1 LIST OF PARTICIPATING CENTRES AND PREVALENT PATIENTS as of 31 DECEMBER 2010 and 2011

LIST OF PARTICIPATING CENTRES AND PREVAI	-LIVI I AIILI		01 01 DE	CEIVIDEI		IIIG Z
		2010			2011	
Public Acute Hospitals and Affiliated Dialysis Centres	HD	PD	TX^	HD	PD	TX^
Singapore General Hospital	9	271	814	8	322	834
Alexandra Hospital		12	10		14	45
an Tock Seng Renal Centre	1	55	12	1 2	58	15
Changi General Hospital  Choo Teck Puat Hospital		5 15			15 20	
National University Hospital		115	373	1	109	383
NUH Dialysis Centre	67	113	373	75	109	303
NUH Renal Centre	10			12		
SHAW NKF – NUH Children's Kidney Centre	5	26	33	3	26	35
Sub-total	92	499	1232	102	564	1267
/oluntary Welfare Organisations	HD	PD	TX	HD	PD	TX
Hong Leong – NKF Dialysis Centre (Aljunied Crescent)	103		174	103		17
FPAS – NKF Dialysis Centre (Algunied Clescent)	100	-		99		
lapan Airline – NKF Dialysis Centre (Ang Mo Kio Ave 9)	98			107		
(wan Im Thong Hood Cho Temple – NKF Dialysis Centre (Simei)	145	-		147		
eong Hwa Chan Si Temple – NKF Dialysis Centre (Teck Whye)	103			105		
New Creation Church – NKF Dialysis Centre	83			83		
IKF Dialysis Centre (Blk 365 Woodlands Ave 5)	103			102		
IKF Hougang Punggol Dialysis Centre	79			89		
ITUC Income – NKF Dialysis Centre (Bukit Batok)	81			81		
ITUC/Singapore Pools – NKF Dialysis Centre (Tampines)	112			112		
Pei Hwa Foundation – NKF Dialysis Centre (Ang Mo Kio Ave 3)	104			116		
SAF – NKF Dialysis Centre (Clementi)	114			112		
SAF – NKF Dialysis Centre (Hong Kah)	77			80		
Sakyadhita – NKF Dialysis Centre (Upper Boon Keng)	94			93		
theng Hong Temple – NKF Dialysis Centre (Jurong West)	103			103		
SIA – NKF Dialysis Centre (Toa Payoh)	74	$\leftarrow$		76		
ingapore Buddhist Welfare Services – NKF Dialysis Centre (Hougang)	133			137		
ingapore Contractors Association NKF Dialysis Centre (Bukit Merah) ingapore Pools – NKF Dialysis Centre (Bedok)	78 84			83		
ampines Chinese Temple – NKF Dialysis Centre (Bedok)	72			75		
ampines Chinese Temple – NKF Dialysis Centre (Pasir Ris) ay Choon Hye – NKF Dialysis Centre (Kim Keat)	106			105		
hong Teck Sian Tong Lian Sin SIA – NKF Dialysis Centre (Woodlands)	111			1105		
pa Pavoh Seu Teck Sean Tong – NKF Dialysis Centre (Woodlands)	68	_		68		
Vestern Digital – NKF Dialysis Centre (Ang Mo Kio Ave 6)	133			150		
/oh Hup – NKF Dialysis Centre (Ghim Moh)	0			96		
DF – Bishan Centre	95			88		
DF – Ghim Moh Centre (HD)	45			41		
DF – Ghim Moh Centre (PD)		70			55	
DF – Kreta Ayer (HD)	63			68		
Peoples' Dialysis Centre	93			93		
Sub-total	2654	70	0	2722	55	0
Private Dialysis Centres/Clinics	HD	PD	TX	HD	PD	TX
dvance Renal Therapy	21			26		
RC Kidney Dialysis Centre (Clementi Ave 3) Pte Ltd	18	1		33		
sia Kidney Dialysis Centre (Tampines)	0			14		
sia Kidney Dialysis Centre (Toa Payoh)	0			12		
sia Renal Care (Jurong) Pte Ltd	45			45		
sia Renal Care (Katong) Pte Ltd	44			46		
sia Renal Care (Kembangan) Pte Ltd	26			40		
sia Renal Care (Mt Elizabeth) Pte Ltd	24	1		26	1	
B.Braun Avitum Dialysis Centre	0			38		
pialysis Centre - Youngberg Pte Ltd (Whampoa)	52			55		
ialysis Centre – Youngberg Pte Ltd (Kovan)	66			55		
ialysis Centre – Youngberg Pte Ltd (Serangoon) HC Dialysis Centre Pte Ltd	0			42 12		
nmanuel Dialysis Centre Pte Ltd (Ang Mo Kio)	34	-		36		
nmanuel Dialysis Centre Pte Ltd (Arig Mo Rio)	32	1		31	1	
idney Therapy Centre Pte Ltd (Marsiling Rd Blk136)	55			58		
idney Therapy Centre Pte Ltd (Marshing Rd Bik 136)	25			43		
ephrocare GDI Pte Ltd	26	4		25	3	
ephrocare S & J Dialvsis Centre (Boulevard)	37			36	j	
ephrocare Singapore Dialysis	26			0		
rthe Pte Ltd (Bukit Batok)	43			48		
rthe Pte Ltd (Orchard Rd , Lucky Plaza)	9	1		9	1	
rthe Pte Ltd (Jurong West)	18			41		
rthe Pte Ltd (Tampines Blk 107)	0			47		
affles Dialysis Centre	8			7		
enal & Dialysis Clinic (S) Pte Ltd (Depot Road)	10			10		
enal Health Pte Ltd	77			83		
enal Life Dialysis Centre Pte Ltd (Blk 463 Jurong West)	1 06	$\leftarrow$		10		
enal Therapy Centre Pte Ltd (Bedok Blk 744)	96	_		81		
enal Therapy Centre Pte Ltd (Ang Mo Kio Blk 422)	61			64		
enal Therapy Centre Pte Ltd (Hougang Blk 620)	52 47			49		
enal Therapy Centre Pte Ltd (Jurong East Blk 326) enal Therapy Centre Pte Ltd (Toa Payoh Blk 92)	63	_		49 61		
enal Therapy Services Pte Ltd (Ang Mo Kio Blk 443)	46			45		
enal Therapy Services Pte Ltd (Ang Mo Klo Bik 443)  enal Therapy Services Pte Ltd (Bukit Merah Blk 161)	46	_		45		
enal Therapy Services Pte Ltd (Burkit Merant Bir 101) enal Therapy Services Pte Ltd (Jurong East Bir 104)	85			81		
enal Therapy Services Pte Ltd (Vishun Ring Blk 236)	33			44		
entre For Kidney Disease Pte Ltd (Lucky Plaza)			34			38
race Lee Renal And Medical Clinic Pte Ltd			10			12
idney & Medical Centre			2			4
u Kidney & Medical Centre			24			22
affles Hospital			2			3
tephew Chew Centre for Kidney Disease and Hypertension			32			31
he Kidney Clinic Pte Ltd			0			1
he Singapore Clinic for Kidney Diseases			4			3
		1	18	1		20
Vu Nephrology & Medical Clinic (Wu Medical Clinic Pte Ltd)	1274	7	126	1446	6	134

<sup>^</sup> TX refers to number of transplanted patients

<sup>\*</sup> Included Singapore residents who went overseas for transplantation

#### 2 INTRODUCTION

This report summarises the characteristics of dialysis and renal transplant (donor and recipient) patients among the resident population of Singapore (citizens and permanent residents). These are patients who were diagnosed with Chronic Kidney Failure Stage 5.

# 2.1 Dialysis Programmes

In Singapore, both haemodialysis (HD) and peritoneal dialysis (PD) are available for patients with end-stage renal failure. While the practice of PD is almost totally confined to the Public Acute Hospitals, HD is practised in different settings as detailed below:

- 1. Public Acute Hospitals where hospital-based centres provide total care dialysis;
- 2. Dialysis Centres run by Voluntary Welfare Organisations where free-standing centres provide total care for elderly patients and those unable to perform self-dialysis, as well as assisted care for the more able patients;
- 3. Private centres that provide total care dialysis in hospital-based as well as free-standing centres in the private sector.

# 2.2 Transplantation Programmes

Both living and deceased-donor renal transplants are performed in Singapore. Transplants from live donors are performed in both the public acute and private hospitals while deceased-donor transplants are only performed in Public Acute Hospitals. In addition, patients return for follow-up at hospitals in Singapore after having received a transplant overseas.

# 2.3 Method of Payment

The Ministry of Health provides subsidies to lower- and middle-income PD and HD patients. The subsidy framework for renal dialysis was recently enhanced and subsidy coverage extended to more middle income households. Government subsidies are also provided for selected immunosuppressive drugs for subsidised patients in our public healthcare institutions to help patients with drug cost after transplantation. In addition, patients can also use Medisave (a national medical savings scheme) and MediShield benefits (a low cost basic medical insurance scheme) to pay for their dialysis or immunosuppressive drugs after Government subsidies. Voluntary welfare organisations such as the National Kidney Foundation, Kidney Dialysis Foundation and Peoples' Dialysis Centre also provide charity assistance to dialysis patients who need further financial assistance.

#### 3 DATA COLLECTION

#### 3.1 Methods of Data Collection

Data was collected from all centres in Singapore providing care for end-stage renal failure patients through the following methods:

- 1. Annual audits on 31 December of each year. New patients are registered using Registry forms (Appendix I) while existing patients have their data reconfirmed and updated (e.g. change in dialysis modality, location, etc) in the central database. Cases were identified based on serum creatinine > 10 mg/dl or 880 μmol/L or on initiation of renal replacement therapy. From year 2007 onwards, the Singapore General Hospital, which contributed about 50% of new cases, started to provide a listing of patients with estimated glomerular filtration rate (eGFR) < 15 ml/min (corrected for BSA 1.73 m²) to the registry to replace serum creatinine listing for case findings. Similarly, the National University Hospital, which contributed about 20% of new cases, started to provide listing of patients with eGFR < 15 ml/min (corrected for BSA 1.73 m²) to the registry to replace serum creatinine listing for case findings from year 2009.</p>
- 2. An event-driven basis where abbreviated forms are submitted to the Registry to register a patient's change in dialysis location, modality or death when the event occurs.
- 3. Submission of Registry forms was on a voluntary basis, until the introduction of the National Registry of Diseases Act in 2007. Data capture is estimated at 95% of all dialysis patients in Singapore.
- 4. New transplant cases are identified by matching the master lists from the transplant centres against existing data in the central database. The Registry Coordinators then extract relevant data from the case-notes in the Medical Record Office of the hospitals.

# 3.2 Database System

The Registry initially used the Microsoft Visual Foxpro<sup>™</sup> Version 5.0 for data entry. The data was later migrated to Microsoft Access in 2000 and finally to a web-based application with Oracle database in 2006.

The web-based application was built with stringent validation rules and features to prevent unauthorised access, to protect patient confidentiality, to identify duplication of records and to detect missing or out-of-range values.

#### 4 DATA CLEANING AND ANALYSIS

A snapshot of data for the years 2010 – 2011 was used to generate trends and check for obvious errors and inconsistency. Erroneous data items were identified, extracted and passed to the team of renal registry coordinators for verification and data cleaning.

The tables and figures in this monograph were generated based on data snapshot taken on 17th June 2013. Hence, numbers and estimates for a particular year would differ from the previous monographs due to updating of figures in the latest dataset. Dialysis modality at 90 days after initiation was used in the computation of incidence, prevalence and survival analysis. This methodology was first applied in the Second Report of the Singapore Renal Registry 1998. In most instances, STATA version 10.1 was used in data analysis.

In this report, we used mid-year population estimates of Singapore residents from the Department of Statistics (DOS), Singapore to calculate the rates. Age standardised rates (ASR) were derived by the direct method using the UICC "World" Population. (Doll R, Muir C, Waterhouse J (eds) Cancer Incidence in Five Continents Vol. 2, Geneva, UICC, 1970). All rates were expressed in per million population (pmp).

Deaths that occurred in the year were categorised according to the modality at the time of deaths.

#### Survival Analysis

The Kaplan-Meier method was used to calculate unadjusted survival probabilities. Deaths were defined as events for dialysis and transplanted patients. Survival was computed till death or till March 2013 for those who were alive.

Patients who switched modality and remained on the switched modality for at least 60 days had the survival experience attributed to the switched modality. Patients who remained on the switched modality for less than 60 days had their survival experience attributed to the original modality.

Patients on dialysis were censored if they received a kidney transplant.

For analysis of graft survival for renal transplants, graft loss as defined by return to dialysis or a preemptive renal transplant and death with a functioning graft were defined as events. Deaths from all causes were considered as events for calculations of patient survival.

#### Bio-clinical indicators

Bio-clinical (e.g. haemoglobin) values were reported from 2005 onwards when the registry started collecting these data items.

In this monograph, the numbers in tables and figures were rounded to one decimal place. In addition, the percentages may not add up to 100% due to rounding error.

#### 5 SYNOPSIS 2010 – 2011

#### 5.1 Dialysis

## 5.1.1 Stock and Flow (1999 – 2011)

Intake of new dialysis patients increased from 663 in 2005 to 904 in 2011. Prevalent dialysis patients increased from 3565 in 2005 to 4895 in 2011.

The number of renal transplants varied between 84 and 124 in the period 2005 – 2011. Patients with functioning transplant increased from 1112 in 2005 to 1403 in 2011.

#### 5.1.2 Demographics

#### 5.1.2.1 New Patients Diagnosed with CKD5

Of the CKD5 patients, the proportion of males was 53.4% in 2010 and 52.0% in 2011. The mean and median age was 64.2 years in 2010 and 65.4 years (median 65.9 years) in 2011; and the modal age group was 60 – 69 in both years.

Among the incident CKD5 patients, diabetic nephropathy (60.4% in 2010, 63.5% in 2011) was the most common cause of CKD5. Primary glomerulonephritis accounted for 15.1% in 2010 and 12.8% in 2011 while hypertension and renovascular disease accounted for 16.1% and 15.7% in 2010 and 2011 respectively.

#### 5.1.2.2 New Patients on Dialysis

#### (1 January 2010 – 31 December 2010)

Of the 741 new CKD5 patients who survived 90 days after initiation of dialysis (Crude rate, CR 206.9 per million population (pmp); Age standardised rate, ASR 166.0 pmp), 55.2% were males (CR 219.8 pmp; ASR 166.1 pmp). 611 patients (CR 170.6 pmp; ASR 135.7 pmp) or 82.5% of those who survived 90 days after initiation of dialysis were on HD compared with 17.5% on PD. The mean age of patients surviving 90 days on dialysis was 61.3 years (median 61.5 years) with 55.6% aged 60 years and above.

#### (1 January 2011 – 31 December 2011)

Of the 904 new CKD5 patients who survived 90 days after initiation of dialysis (Crude rate, CR 248.2 per million population (pmp); Age standardised rate, ASR 192.6 pmp), 61.3% were males (CR 296.5 pmp; ASR 217.1 pmp). 741 patients (CR 203.4 pmp; ASR 157.2 pmp) or 82.0% of those who survived 90 days after initiation of dialysis were on HD compared with 18.0% on PD. The mean age of patients surviving 90 days on dialysis was 60.9 years (median 61.2 years) with 55.0% aged 60 years and above.

#### 5.1.2.3 Existing Patients on Dialysis

#### (As of 31 December 2010)

Of the 4596 prevalent patients on dialysis (CR 1218.5 pmp; ASR 896.4 pmp), 52.6% were males (CR 1299.8 pmp; ASR 981.4 pmp). There were 4020 patients (CR 1065.8 pmp; ASR 778.4 pmp, 87.5%) on hemodialysis and 576 patients (CR 152.7 pmp; ASR 118.0 pmp, 12.5%) on PD. The mean age was 60.4 years (median 60.9 years) with 52.9% aged 60 years and above.

#### (As of 31 December 2011)

Of the 4895 prevalent patients on dialysis (CR 1291.8 pmp; ASR 919.2 pmp), 54.5% were males (CR 1429.2 pmp; ASR 1045.0 pmp). There were 4270 patients (CR 1126.9 pmp; ASR 795.2 pmp, 87.2%) on hemodialysis and 625 patients (CR 164.9 pmp; ASR 124.0 pmp, 12.8%) on PD. The mean age was 60.7 years (median 61.2 years) with 53.9% aged 60 years and above.

# 5.1.3 Primary Renal Disease

New patients on dialysis in 2010: Diabetic nephropathy and primary glomerulonephritis were the commonest cause of CKD5 at 63.3% and 19.0% respectively. Only 37.6% (53/141) of primary glomerulonephritis cases were biopsy-proven of which IgA nephropathy was the commonest at 52.8% (28/53). Secondary glomerulonephritis and other autoimmune diseases accounted for 0.8% (6/741) of CKD5.

New patients on dialysis in 2011: Diabetic nephropathy and primary glomerulonephritis were the commonest cause of CKD5 at 61.0% and 17.6% respectively. Only 35.8% (57/159) of primary glomerulonephritis cases were biopsy-proven of which IgA nephropathy was the commonest at 31.6% (18/57). Secondary glomerulonephritis and other autoimmune diseases accounted for 1.0% (9/904) of CKD5.

Prevalent patients on dialysis in 2010: 32.5% (1495/4596) and 45.3% (2081/4596) of patients had primary glomerulonephritis (386/4596, 8.4% were biopsy proven) and diabetic nephropathy attributed as their cause of CKD5, respectively. Secondary glomerulonephritis and other autoimmune diseases accounted for 2.4% (112/4596) of CKD5. Of the biopsy-proven primary GN, IgA nephropathy accounted for 57.8% (223/386).

Prevalent patients on dialysis in 2011: 31.1% (1524/4895) and 46.6% (2283/4895) of patients had primary glomerulonephritis (412/4895, 8.4% were biopsy proven) and diabetic nephropathy attributed as their cause of CKD5, respectively. Secondary glomerulonephritis and other autoimmune diseases accounted for 2.3% (114/4895) of CKD5. Of the biopsy-proven primary GN, IgA nephropathy accounted for 53.9% (222/412).

#### 5.1.4 Co-morbid Conditions

In year 2010, prevalent dialysis patients had the following co-morbidities: diabetes mellitus (52.9%), ischaemic heart disease (44.7%), cerebrovascular disease (18.8%), peripheral vascular disease (13.8%). 3.9% of them had positive Hepatitis BsAg status.

In year 2011, prevalent dialysis patients had the following co-morbidities: diabetes mellitus (54.5%), ischaemic heart disease (45.7%), cerebrovascular disease (19.7%), peripheral vascular disease (15.1%). 4.0% of them had positive Hepatitis BsAg status.

# 5.1.5 Haemodialysis

In 2010, 611 incident patients survived 90 days on HD (CR 170.6 pmp; ASR 135.7 pmp). There were 4020 prevalent patients (CR 1065.8 pmp; ASR 778.4 pmp) on HD with mean age of 60.6 years. 53.0% of patients were aged 60 years and above. Majority of prevalent patients were dialysed in dialysis centres managed by voluntary welfare organisations (66.0%) followed by 31.7% in private dialysis centres and 2.3% in Public Acute Hospitals.

In 2011, 741 incident patients survived 90 days on HD (CR 203.4 pmp; ASR 157.2 pmp). There were 4270 prevalent patients (CR 1126.9 pmp; ASR 795.2 pmp) on HD with mean age of 60.9 years. 53.5% of patients were aged 60 years and above. Majority of prevalent patients were dialysed in dialysis centres managed by voluntary welfare organisations (63.7%) followed by 33.9% in private dialysis centres and 2.4% in Public Acute Hospitals.

# 5.1.6 Peritoneal Dialysis

In 2010, 130 incident patients who survived 90 days were on PD (CR 34.5 pmp; ASR 26.1 pmp). There were 576 prevalent patients (CR 152.7 pmp; ASR 118.0 pmp) on PD with mean age of 58.8 years. 52.7% were aged 60 years and above. Majority received treatment in Public Acute Hospitals (86.6%).

In 2011, 163 incident patients who survived 90 days were on PD (CR 43.0 pmp; ASR 31.1 pmp). There were 625 prevalent patients (CR 164.9 pmp; ASR 124.0 pmp) on PD with mean age of 59.5 years. 56.1% were aged 60 years and above. Majority received treatment in Public Acute Hospitals (90.2%).

#### 5.1.7 Dialysis Deaths

In 2010, there were 560 deaths (CR 148.5 pmp; ASR 108.6 pmp) with a death rate of 10.7% (560/5221). The death rate for those on HD was at 9.6% and PD at 17.7%. Cardiac events and infection were the commonest cause of death at 32.9% and 32.0% respectively; cerebrovascular death was at 3.6%.

In 2011, there were 663 deaths (CR 174.9 pmp; ASR 120.8 pmp) with a death rate of 11.8% (663/5634). The death rate for those on HD was at 11.4% and PD at 14.1%. Cardiac events and infection were the commonest cause of death at 35.6% and 32.3% respectively; cerebrovascular death was at 4.1%.

#### 5.1.8 Survival Analysis

Patient survival for HD was 59.8% at 5 years for the period 1999 - 2011. The corresponding figures for PD were 35.3% at 5 years. The median survival was 6.7 years for HD patients and 3.5 years for PD patients.

#### 5.1.9 Management of Dialysis Patients

In year 2010, the median haemoglobin (Hb) level was 11.1 g/dl (Range: 5.1 – 17.4) among HD patients, and 10.8 g/dl (Range: 6.4 – 17.4) among PD patients.

In year 2011, the median haemoglobin (Hb) level was 11.2 g/dl (Range: 5.1 – 17.9) among HD patients, and 10.7 g/dl (Range: 6.8 – 16.8) among PD patients.

In 2010, the percentage of HD patients on ESA and with TSAT  $\geq$  20% was 88.9% for patients with Hb  $\geq$  10 g/dl, and 76.8% for patients with Hb < 10 g/dl. Similarly, the percentage of PD patients on ESA and with TSAT  $\geq$  20% was 90.2% for patients with Hb  $\geq$  10 g/dl, and 81.1% for patients with Hb < 10 g/dl.

In 2011, the percentage of HD patients on ESA and with TSAT  $\geq$  20% was 84.8% for patients with Hb  $\geq$  10 g/dl, and 72.0% for patients with Hb < 10 g/dl. Similarly, the percentage of PD patients on ESA and with TSAT  $\geq$  20% was 81.8% for patients with Hb  $\geq$  10 g/dl, and 75.0% for patients with Hb < 10 g/dl.

Regardless of modality and level of TSAT, the median Hb level among prevalent patients without ESA was higher than prevalent patients with ESA in the period 2005 – 2011.

The average serum albumin level among the PD patients is lower than that among the HD patients. In year 2011, the mean serum albumin level is 35.0 g/L for the HD patients and 30.2 g/L for the PD patients.

Among the HD and PD patients, the mean corrected calcium level among the HD and PD patients remains constant at 2.4 mmol/L across the years in 2008 – 2011. Similarly, the mean phosphate level is about 1.6 mmol/L across the years in 2008 – 2011.

Among the HD and PD patients, the average iPTH level is similar. It is also observed that the iPTH values can be unusually elevated. The median iPTH level hovered at 25 pmol/L among the HD patients, and at 27 pmol/L among the PD patients. In year 2011, the median iPTH level for HD patients was 24.7 pmol/L (Range: 0.1 - 431), and for PD patients was 27.6 pmol/L (Range: 0.1 - 327).

# 5.2 Transplants

#### 5.2.1 Demographics

#### 5.2.1.1 New Transplant Patients

There were 61 (CR 16.2 pmp) new kidney transplant recipients in 2010. Of these, male recipients comprised 50.0%. In addition, 23 patients in 2010 (CR 6.1 pmp) received transplants overseas.

There were 67 (CR 17.7 pmp) new kidney transplant recipients in 2011. Of these, male recipients comprised 58.2%. In addition, 24 patients in 2011 (CR 6.3 pmp) received transplants overseas.

#### 5.2.1.2 Prevalent Transplanted Patients

#### As of 31 December 2010

There were 1364 prevalent transplant patients (CR 361.6 pmp, ASR 265.1 pmp) in 2010. Of these, 53.9% were males. Mean age was 51.7 years. The prevalent transplant population was predominately Chinese (83.0%).

#### As of 31 December 2011

There were 1403 prevalent transplant patients (CR 370.3 pmp, ASR 266.4 pmp) in 2011. Of these, 53.3% were males. Mean age was 52.3 years. The prevalent transplant population was predominately Chinese (82.6%).

#### 5.2.2 Primary Renal Disease

For the prevalent transplanted population, the commonest known primary renal disease was primary glomerulonephritis at 71.3% in 2010 and 71.0% in 2011. Diabetic nephropathy accounted for only 7.3% in 2010 and 2011 while autoimmune disease accounted for 4.1% in 2010 and 4.3% in 2011.

#### 5.2.3 Co-morbid Conditions

Co-morbidities for prevalent transplanted patients in year 2010 included diabetes mellitus in 26.1%, ischaemic heart disease 15.4%, cerebrovascular disease 4.5% and peripheral vascular disease 1.8%. 3.2% had positive Hepatitis BsAg status.

Co-morbidities for prevalent transplanted patients in year 2011 included diabetes mellitus in 25.3%, ischaemic heart disease 15.4%, cerebrovascular disease 4.7% and peripheral vascular disease 1.9%. 3.5% had positive Hepatitis BsAg status.

#### 5.2.4 Location where Transplant was Performed

Among prevalent patients in 2010, the transplants performed at the Singapore General Hospital constituted 49.0%, followed by transplants performed at overseas centres at 30.2% and those performed at the National University Hospital at 16.6%.

Among prevalent patients in 2011, the transplants performed at the Singapore General Hospital constituted 48.7%, followed by transplants performed at overseas centres at 29.7% and those performed at the National University Hospital at 16.9%.

# 5.2.5 Donor Type

Among prevalent patients in 2010, deceased-donor transplantation constituted the highest at 66.6% (592 local, 317 overseas). Live-donor transplant, either biologically or emotionally related was the next most common at 26.5% (357 local, 22 overseas), while unrelated live-donor transplant constituted 5.4%.

Among prevalent patients in 2011, deceased-donor transplantation constituted the highest at 65.7% (602 local, 320 overseas). Live-donor transplant, either biologically or emotionally related was the next most common at 28.9% (380 local, 25 overseas), while unrelated live-donor transplant constituted 5.2%.

# 5.2.6 Survival Analysis

Transplant patient survival was 97.7% at 1 year and 92.5% at 5 years for patients transplanted in the period 1999 to 2011. The corresponding 1 and 5-year graft survivals were 95.0% and 89.8% respectively.

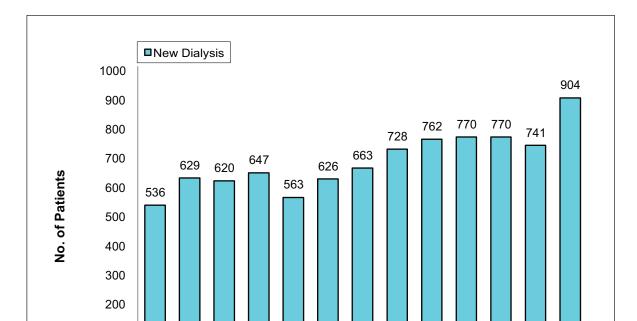
#### 6 STOCK AND FLOW

The number of new and prevalent dialysis patients has increased over the years (incidence 663, prevalence 3565 in 2005; incidence 904, prevalence 4895 in 2011). The number of renal transplants ranged from 84 in 2010 at its lowest and 124 in 2006 at its highest. Patients with functioning transplant have increased from 1112 to 1403 over the same period. See Table 6.1.

Table 6.1: STOCK AND FLOW OF RRT, 2005 – 2011

Stock and Flow of RRT 2005 - 2011	2005	2006	2007	2008	2009	2010	2011
New Dialysis patients	663	728	762	770	770	741	904
New Transplants	117	124	112	104	96	84	91
Dialysis deaths	546	557	643	592	603	560	663
Transplant deaths*	23	20	29	25	27	18	20
Dialysis as at 31st December	3565	3774	3943	4174	4382	4596	4895
Functioning transplants as at 31st December	1112	1181	1232	1277	1325	1364	1403

<sup>\*</sup> Refers to all transplant deaths that occurred among all new and functioning transplants during a particular year



1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 **Year** 

Figure 6.1: NEW DIALYSIS PATIENTS, 1999 – 2011



100

0

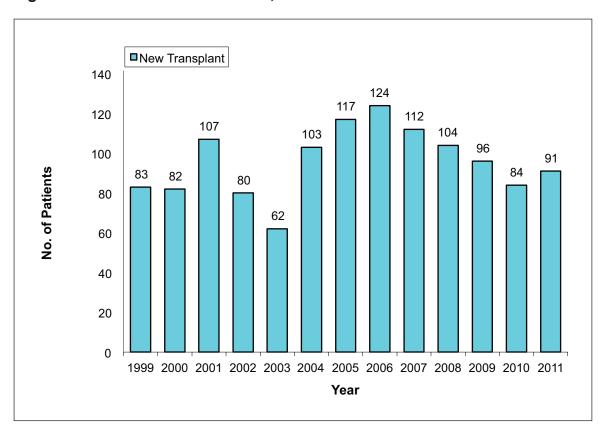


Figure 6.3: PREVALENT DIALYSIS PATIENTS AS AT 31<sup>ST</sup> DECEMBER, 1999 – 2011

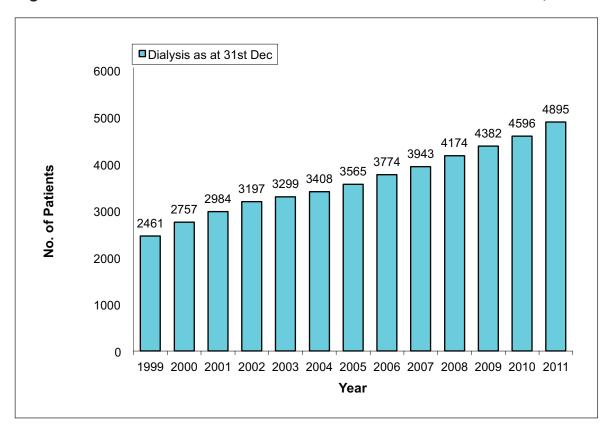
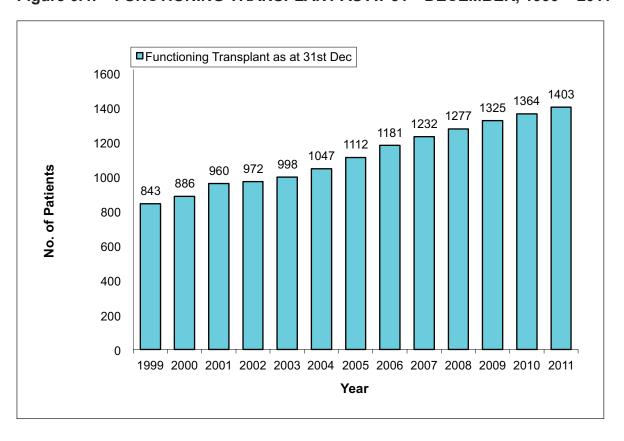


Figure 6.4: FUNCTIONING TRANSPLANT AS AT 31<sup>ST</sup> DECEMBER, 1999 – 2011



#### 7 THE CKD5 POPULATION

#### 7.1 Incidence and Prevalence

#### 7.1.1 Introduction

This section reports the incidence and prevalence of Chronic Kidney Disease Stage 5 (CKD5). Incidence is defined as the number of new CKD5 patients in a year while prevalence is defined as the total number of cases of CKD5 at a specific time point, namely, 31 December of the year in this report. Incidence is a measure of development of renal disease in the population, whereas prevalence describes the burden of renal disease in the population.

An increasing trend of CKD5 patients was observed from 1999 to 2011. In year 2010, there were 1443 new CKD5 patients (CR: 382.6 per million population (pmp); ASR: 273.1 pmp). Similarly, in year 2011, there were 1544 new CKD5 patients (CR: 407.5 pmp; ASR: 281.3 pmp).

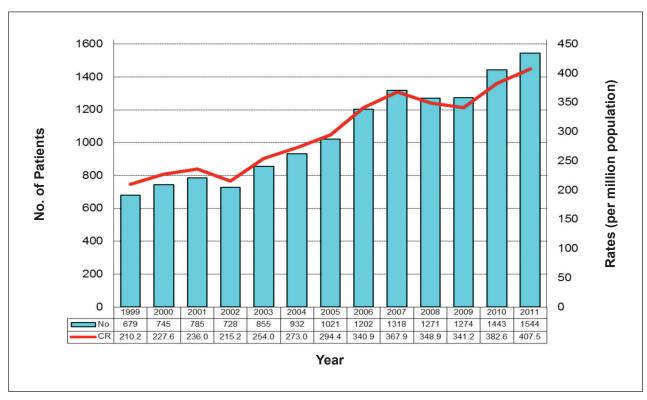


Figure 7.1.1.1: CRUDE RATES AND TOTAL FOR CKD5, 1999 – 2011

<sup>\*</sup> Note that CKD5 patients were started to be collected from year 2007 onwards.

#### 7.1.2 Incident CKD5 Patients

# 7.1.2.1 Incident CKD5 Patients by Age Group and Gender

Of the CKD5 patients, the proportion of males was 53.4% in 2010 and 52.0% in 2011. The mean and median age was 64.2 years in 2010 and 65.4 years (median 65.9 years) in 2011; and the modal age group was 60 – 69 in both years. See Table 7.1.2.1.

Table 7.1.2.1: INCIDENT CKD5 PATIENTS BY AGE GROUP AND GENDER

	2010								
AGE GROUP	Ma	ale	Fen	nale	Both Genders				
	No	%	No	%	No	%			
0–19	3	0.4	3	0.4	6	0.4			
20–29	8	1.0	3	0.4	11	0.8			
30–39	30	3.9	20	3.0	50	3.5			
40–49	85	11.0	76	11.3	161	11.2			
50–59	207	26.9	127	18.9	334	23.1			
60–69	196	25.5	148	22.0	344	23.8			
70–79	154	20.0	182	27.0	336	23.3			
80+	87	11.3	114	16.9	201	13.9			
All Age Groups	770	100	673	100	1443	100			

	2011								
AGE GROUP	Male		Fen	nale	Both Genders				
	No	%	No	%	No	%			
0–19	3	0.4	3	0.4	6	0.4			
20–29	7	0.9	12	1.6	19	1.2			
30–39	33	4.1	21	2.8	54	3.5			
40–49	81	10.1	49	6.6	130	8.4			
50–59	197	24.5	127	17.1	324	21.0			
60–69	221	27.5	164	22.1	385	24.9			
70–79	173	21.5	211	28.5	384	24.9			
80+	88	11.0	154	20.8	42	15.7			
All Age Groups	803	100	741	100	1544	100			

# 7.1.2.2 Incident CKD5 Patients by Ethnic Group and Gender

The majority of patients were Chinese (70.1% in 2010, 69.4% in 2011) reflecting the racial distribution of the population (Table 7.1.2.2). The male to female ratio was about 1.1 in both years. There was a slight male predominance of males among the Chinese and Indians, while there were more female Malay CKD5 patients in both years.

Table 7.1.2.2: INCIDENT CKD5 PATIENTS BY ETHNIC GROUP AND GENDER

	2010								
ETHNIC GROUP	Male		Fen	nale	Both Genders				
	No	%	No	%	No	%			
Chinese	559	72.6	453	67.3	1012	70.1			
Malay	150	19.5	163	24.2	313	21.7			
Indian	54	7.0	44	6.5	98	6.8			
Others	7	0.9	13	1.9	20	1.4			
All Ethnic Groups	770	100	673	100	1443	100			

	2011								
ETHNIC GROUP	Male		Fen	nale	Both Genders				
	No	%	No	%	No	%			
Chinese	575	71.6	496	66.9	1071	69.4			
Malay	149	18.6	185	25.0	334	21.6			
Indian	68	8.5	46	6.2	114	7.4			
Others	11	1.4	14	1.9	25	1.6			
All Ethnic Groups	803	100	741	100	1544	100			

# 7.1.2.3 Incident CKD5 Patients by Aetiology

Among the incident CKD5 patients, diabetic nephropathy (60.4% in 2010, 63.5% in 2011) was the most common cause of CKD5. Primary glomerulonephritis accounted for 15.1% in 2010 and 12.8% in 2011 while hypertension and renovascular disease accounted for 16.1% and 15.7% in 2010 and 2011 respectively (Table 7.1.2.3).

Table 7.1.2.3: INCIDENT CKD5 PATIENTS BY AETIOLOGY

Cause of CKD5	20	10	2011		
Cause of CND3	No	%	No	%	
Diabetic Nephropathy (DN)	871	60.4	980	63.5	
Primary Glomerulonephritis (GN)	218	15.1	197	12.8	
Autoimmune Disease/GN with Systemic Manifestations	13	0.9	12	0.8	
Hypertension and Renovascular Disease (HYP)	233	16.1	242	15.7	
Polycystic Kidney Disease/Other Cystic Diseases	36	2.5	32	2.1	
Vesicoureteric Reflux/Chronic Pyelonephritis	2	0.1	3	0.2	
Obstruction	16	1.1	17	1.1	
Stone Disease	7	0.5	1	0.1	
Miscellaneous	42	2.9	52	3.4	
Unknown	5	0.3	8	0.5	
All Causes	1443	100	1544	100	

In 2010, there were 6 patients with 0 co-morbidity, 134 patients with 1 co-morbidity, 202 with 2 co-morbidities and 399 patients with more than 2 co-morbidities. In 2011, there were 10 patients with 0 co-morbidity, 178 patients with 1 co-morbidity, 247 patients with 2 co-morbidities and 469 patients with more than 2 co-morbidities.

Diabetes Mellitus as a co-morbid condition occurred in 67.4% of CKD5 patients in 2010 and 70.9% in 2011. Ischaemic heart disease was reported in 45.0% of patients in 2010 and 47.1% in 2011. Cerebrovascular Disease was reported at 27.6% in 2010 and 30.4% in 2011. Among the CKD5 patients, there were 11.2% current smokers in 2010 and 10.9% in 2011. Another 23.6% in 2010 and 21.2% in 2011 were former smokers. The smoking status was unknown in 4.3% of patients in 2010, 4.7% of patients in 2011. See Table 7.1.2.4.

#### 7.1.2.4 Incident CKD5 Patients by Co-morbid Conditions

Table 7.1.2.4: INCIDENT CKD5 PATIENTS BY CO-MORBID CONDITIONS

Diabetic Mellitus	20	10	20	11	
Diabetic Meiitus	No	%	No	%	
Yes	972	67.4	1094	70.9	
No	471	32.6	448	29.0	
Unknown	0	0.0	2	0.1	
Total	1443	100	1544	100	
Ischaemic Heart Disease	20	10	20	11	
Ischaeline Heart Disease	No	%	No	%	
Yes	649	45.0	727	47.1	
No	792	54.9	815	52.8	
Unknown	2	0.1	2	0.1	
Total	1443	100	1544	100	
Cerebrovascular Disease	20	10	2011		
Octobiovasculai Discasc	No	%	No	%	
Yes	398	27.6	469	30.4	
No	1045	72.4	1073	69.5	
Unknown	0	0.0	2	0.1	
Total	1443	100	1544	100	
Smoking	20	10	20	11	
Cilioking	No	%	No	%	
Current Smoker	162	11.2	169	10.9	
Ex-Smoker	340	23.6	327	21.2	
Non-Smoker/Never	879	60.9	975	63.1	
Unknown	62	4.3	73	4.7	
Total	1443	100	1544	100	

# 7.1.2.5 Incident CKD5 Patients by Service Providers

About 96% of the new CKD5 patients were managed by the public acute hospitals, previously known as restructured hospitals (Table 7.1.2.5).

Table 7.1.2.5: INCIDENT CKD5 PATIENTS BY SERVICE PROVIDERS

Service Provider	20	10	2011		
Service Provider	No	%	No	%	
Public Acute Hospitals	1391	96.4	1485	96.2	
Voluntary Welfare Organisations	0	0.0	0	0.0	
Private Centres	52	3.6	59	3.8	
All Providers	1443	100	1544	100	

#### 8 THE DIALYSIS POPULATION

# 8.1 Incidence and Prevalence

#### 8.1.1 Introduction

This section reports the incidence and prevalence of Chronic Kidney Disease Stage 5 (CKD5) treated with dialysis.

Table 8.1.1.1: INCIDENT AND PREVALENT DIALYSIS PATIENTS

		2010			2011	
	No	CR*	ASR*	No	CR*	ASR*
New CKD5 patients	1443	382.6	273.1	1544	407.5	281.3
New patients ever started on dialysis	908	240.7	175.6	1049	276.8	197.1
- On Haemodialysis	833	220.9	160.7	965	254.7	181.0
- On Peritoneal Dialysis	75	19.9	14.9	84	22.2	16.2
New patients for preceding one year surviving 90 days	741	206.9	166.0	904	248.2	192.6
- On Haemodialysis	611	170.6	135.7	741	203.4	157.2
- On Peritoneal Dialysis	130	36.3	30.3	163	44.7	35.4
Prevalence of patients on Dialysis	4596	1218.5	896.4	4895	1291.8	919.2
- On Haemodialysis	4020	1065.8	778.4	4270	1126.9	795.2
- On Peritoneal Dialysis	576	152.7	118.0	625	164.9	124.0
Dialysis death for preceding one year	560	148.5	108.6	663	175.0	120.8
Transplanted in Singapore	61	16.2	_	67	17.7	_
Transplanted in Overseas	23	6.1	_	24	6.3	_
Transplanted death with functioning graft	18	4.8	_	18	4.8	_
Transplanted death with graft loss	0	0.0	_	2	0.5	_
Transplanted with graft loss	22	5.8	_	32	8.4	_
Prevalent Transplant Population	1364	361.6	265.1	1403	370.3	266.4

<sup>\*</sup> per million residential population

<sup>^</sup> Note that the ASRs were not computed, as the numbers were too small for meaningful analysis.

During the period of 1 January to 31 December in 2010, 1443 patients (CR 382.6 pmp; ASR 273.1 pmp) were diagnosed with CKD5. See Table 8.1.1.1. In the same year, 908 patients were started on dialysis. Of these, 741 patients (CR 206.9 pmp; ASR 166.0 pmp) survived 90 days after initiation in 2010.

During the same period in 2011, 1544 patients (CR 407.5 pmp; ASR 281.3 pmp) were diagnosed with CKD5. There were 1049 patients whostarted dialysis of which 904 patients (CR 248.2 pmp; ASR 192.6 pmp) survived 90 days after initiation.

The time trend observed in patients initiating HD is different from that in patients initiating PD. See Figure 8.1.1.1.

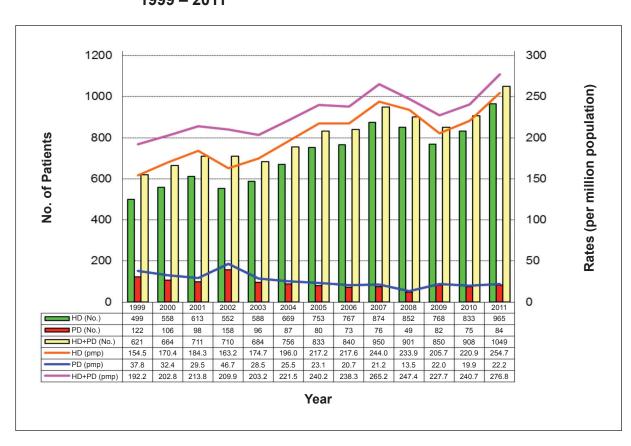


Figure 8.1.1.1: CRUDE RATES AND TOTAL FOR EVER STARTED DIALYSIS, 1999 – 2011

Subsequent information refers to the new patients who were still on dialysis 90 days after commencement.

The number and rates of CKD5 patients who survived 90 days after initiation followed the trends for CKD5 patients initiated on dialysis and is defined as "Definitive Dialysis". See Figure 8.1.1.2.

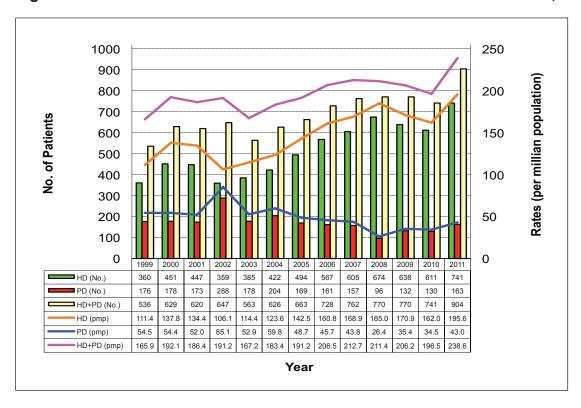
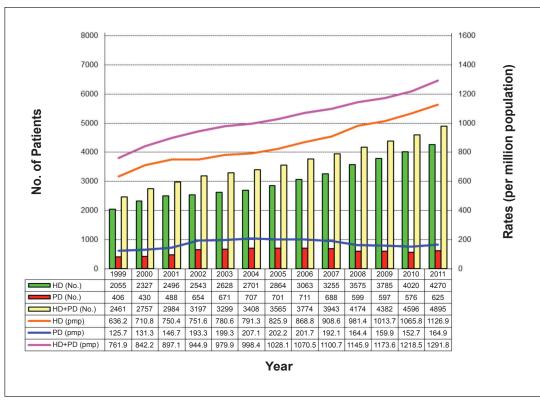


Figure 8.1.1.2: CRUDE RATES AND TOTAL FOR DEFINITIVE DIALYSIS, 1999 – 2011

There were an increasing number of prevalent patients in both dialysis modalities from 1999 to 2011. See Figure 8.1.1.3.

Figure 8.1.1.3: CRUDE RATES AND TOTAL FOR PREVALENT DIALYSIS PATIENTS, 1999 – 2011



#### 8.1.2 Incident Dialysis Patients

# 8.1.2.1 Incident Dialysis Patients by Age Group and Gender

Among definitive dialysis patients, males comprised 55.2% in dialysis patients who survived 90 days after commencement of dialysis in 2010 while this was 61.3% in 2011. Mean age was 61.3 years (median 61.5 years) and modal age group was 60-69 years for 2010. The proportion of CKD5 patients aged 60 years and above at initiation of dialysis was 55.6%. Corresponding figures for 2011 was mean age of 60.9 years (median 61.5 years), modal age group was 60-69 years, and the proportion of CKD5 patients aged 60 years and above at initiation of dialysis was 55.0%. See Table 8.1.2.1.1.

Table 8.1.2.1.1: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND GENDER

	2010						
AGE GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
0–19	1	0.2	2	0.6	3	0.4	
20–29	6	1.5	6	1.8	12	1.6	
30–39	15	3.7	10	3.0	25	3.4	
40–49	39	9.5	44	13.3	83	11.2	
50–59	126	30.8	80	24.1	206	27.8	
60–69	133	32.5	99	29.8	232	31.3	
70–79	61	14.9	70	21.1	131	17.7	
80+	28	6.8	21	6.3	49	6.6	
All Age Groups	409	100	332	100	741	100	

	2011						
AGE GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
0–19	1	0.2	3	0.9	4	0.4	
20–29	9	1.6	5	1.4	14	1.5	
30–39	27	4.9	12	3.4	39	4.3	
40–49	73	13.2	34	9.7	107	11.8	
50–59	149	26.9	94	26.9	243	26.9	
60–69	166	30.0	98	28.0	264	29.2	
70–79	102	18.4	76	21.7	178	19.7	
80+	27	4.9	28	8.0	55	6.1	
All Age Groups	554	100	350	100	904	100	

Figure 8.1.2.1.1 showed the trends in proportions of patients on dialysis from 1999 to 2011 by age group.

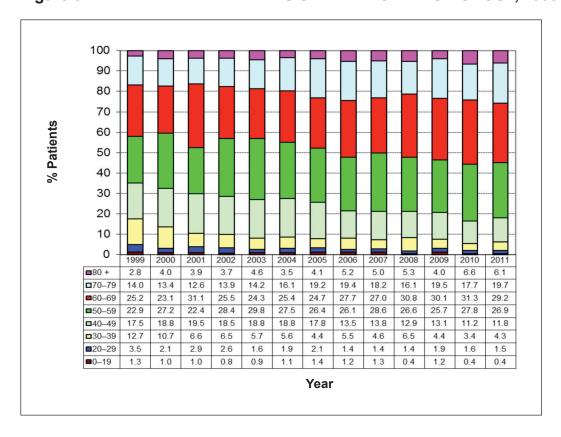


Figure 8.1.2.1.1: INCIDENT DIALYSIS PATIENTS BY AGE GROUP, 1999 - 2011

# 8.1.2.2 Incident Dialysis Patients by Age Group and Modality

With the exception of age group 0-19 years in 2011, there was a comparatively greater percentage of patients started on HD. See Table 8.1.2.2.1.

Table 8.1.2.2.1:	INCIDENT DIALYSIS PATIENTS BY AGE GROUP
	AND MODALITY, 2010

	2010					
AGE GROUP	Н	D	Р	D		
	No	%	No	%		
0–19	2	66.7	1	33.3		
20–29	8	66.7	4	33.3		
30–39	21	84.0	4	16.0		
40–49	76	91.6	7	8.4		
50–59	177	85.9	29	14.1		
60–69	186	80.2	46	19.8		
70–79	101	77.1	30	22.9		
80+	40	81.6	9	18.4		
Total	611	82.5	130	17.5		

Table 8.1.2.2.1: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2011

	2011						
AGE GROUP	Н	D	PD				
	No	%	No	%			
0–19	1	25.0	3	75.0			
20–29	9	64.3	5	35.7			
30–39	27	69.2	12	30.8			
40–49	98	91.6	9	8.4			
50–59	204	84.0	39	16.0			
60–69	218	82.6	46	17.4			
70–79	148	83.1	30	16.9			
80+	36	65.5	19	34.5			
Total	741	82.0	163	18.0			

# 8.1.2.3 Incident Dialysis Patients by Ethnic Group and Gender

In both years, the racial composition is similar to the racial distribution of the population. There is a male predominance in Chinese but female predominance in Malay and other races.

Table 8.1.2.3.1: INCIDENT DIALYSIS PATIENTS BY ETHNIC GROUP AND GENDER

	2010						
ETHNIC GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
Chinese	294	71.9	193	58.1	487	65.7	
Malay	85	20.8	110	33.1	195	26.3	
Indian	25	6.1	24	7.2	49	6.6	
Others	5	1.2	5	1.5	10	1.3	
All Ethnic Groups	409	100	332	100	741	100	

	2011						
ETHNIC GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
Chinese	396	71.5	219	62.6	615	68.0	
Malay	107	19.3	101	28.9	208	23.0	
Indian	43	7.8	21	6.0	64	7.1	
Others	8	1.4	9	2.6	17	1.9	
All Ethnic Groups	554	100	350	100	904	100	

In the period 1999 – 2011, the proportion of Chinese dialysis patients was the highest among the different ethnic groups and maintained above 60% almost every year. See Figure 8.1.2.3.1.

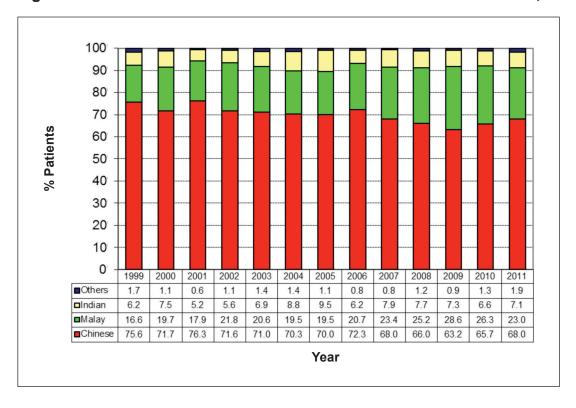


Figure 8.1.2.3.1: INCIDENT DIALYSIS PATIENTS BY ETHNIC GROUP, 1999 - 2011

With the exception of year 1999, the proportion of male dialysis patients was greater than that for females for the period 1999 to 2011. See Figure 8.1.2.3.2.

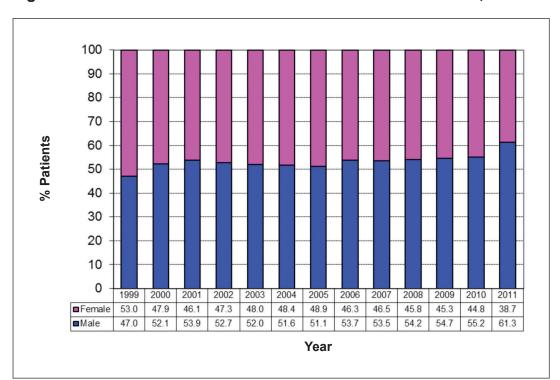


Figure 8.1.2.3.2: INCIDENT DIALYSIS PATIENTS BY GENDER, 1999 – 2011

#### 8.1.3 Prevalent Dialysis Patients

# 8.1.3.1 Prevalent Dialysis Patients by Age Group and Gender

There were 4596 prevalent dialysis patients (CR 1218.5 pmp; ASR 896.4 pmp) at the end of 2010 (Table 8.1.1.1). Of these, 52.6% (CR 1299.8 pmp; ASR 981.4 pmp) were males. The mean age was 60.4 years (median 60.9 years). The proportion aged 60 years and above was 52.9% (Table 8.1.3.1.1).

At the end of 2011, there were 4895 prevalent dialysis patients (CR 1291.8 pmp, ASR 919.2 pmp). 54.5% of them (CR 1429.2 pmp; ASR 1045.0 pmp) were males, mean age 60.7 years (median 61.2 years), proportion aged 60 years and above was 53.9%.

Table 8.1.3.1.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND GENDER

	2010						
AGE GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
0–19	6	0.2	11	0.5	17	0.4	
20–29	38	1.6	25	1.1	63	1.4	
30–39	103	4.3	82	3.8	185	4.0	
40–49	317	13.1	282	13.0	599	13.0	
50–59	711	29.4	590	27.1	1301	28.3	
60–69	737	30.5	622	28.6	1359	29.6	
70–79	412	17.0	447	20.5	859	18.7	
80+	95	3.9	118	5.4	213	4.6	
All Age Groups	2419	100	2177	100	4596	100	

	2011						
AGE GROUP	Ma	ale	Fen	Female		Genders	
	No	%	No	%	No	%	
0–19	7	0.3	10	0.4	17	0.3	
20–29	43	1.6	24	1.1	67	1.4	
30–39	107	4.0	78	3.5	185	3.8	
40–49	343	12.8	273	12.3	616	12.6	
50–59	763	28.6	609	27.4	1372	28.0	
60–69	829	31.0	644	28.9	1473	30.1	
70–79	457	17.1	459	20.6	916	18.7	
80+	121	4.5	128	5.8	249	5.1	
All Age Groups	2670	100	2225	100	4895	100	

The trends in age groups are shown in Figure 8.1.3.1.1. The proportion of patients in age groups 60 years and above increased while the remaining age groups decreased or remained constant. Notably, proportion of dialysis patients aged 60 years and above increased from 36.5% in 1999 to 53.9% in 2011.

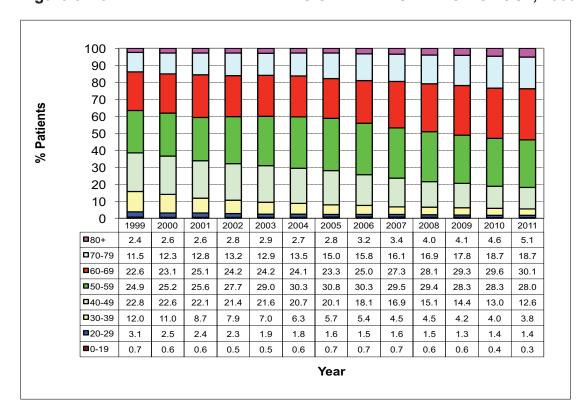


Figure 8.1.3.1.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP, 1999 – 2011

# 8.1.3.2 Prevalent Dialysis Patients by Age Group and Modality

Among the middle-aged and elderly, the proportion of HD patients hovered between 85% and 90%. See Table 8.1.3.2.1.

Table 8.1.3.2.1:	PREVALENT DIALYSIS PATIENTS BY AGE GROUP
	AND MODALITY, 2010

	2010						
AGE GROUP	Н	D	Р	D			
	No	%	No	%			
0–19	2	11.8	15	88.2			
20–29	39	61.9	24	38.1			
30–39	164	88.6	21	11.4			
40–49	537	89.6	62	10.4			
50–59	1151	88.5	150	11.5			
60–69	1189	87.5	170	12.5			
70–79	746	86.8	113	13.2			
80+	192	90.1	21	9.9			
Total	4020	87.5	576	12.5			

Table 8.1.3.2.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2011

	2011						
AGE GROUP	Н	D	PD				
	No	%	No	%			
0–19	1	5.9	16	94.1			
20–29	41	61.2	26	38.8			
30–39	162	87.6	23	12.4			
40–49	549	89.1	67	10.9			
50–59	1230	89.7	142	10.3			
60–69	1274	86.5	199	13.5			
70–79	803	87.7	113	12.3			
80+	210	84.3	39	15.7			
Total	4270	87.2	625	12.8			

# 8.1.3.3 Prevalent Dialysis Patients by Ethnic Group and Gender

In both years, the racial composition is similar to the racial distribution of the population. There is a male predominance in Chinese and Indians but female predominance in Malay and other races.

Table 8.1.3.3.1: PREVALENT DIALYSIS PATIENTS BY ETHNIC GROUP AND GENDER

	2010						
ETHNIC GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
Chinese	1736	71.8	1424	65.4	3160	68.8	
Malay	485	20.0	591	27.1	1076	23.4	
Indian	175	7.2	137	6.3	312	6.8	
Others	23	1.0	25	1.1	48	1.0	
All Ethnic Groups	2419	100	2177	100	4596	100	

	2011							
ETHNIC GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
Chinese	1902	71.2	1442	64.8	3344	68.3		
Malay	544	20.4	617	27.7	1161	23.7		
Indian	197	7.4	135	6.1	332	6.8		
Others	27	1.0	31	1.4	58	1.2		
All Ethnic Groups	2670	100	2225	100	4895	100		

As in incident dialysis patients, the racial composition is similar to the racial distribution of the population in both years. See Figure 8.1.3.3.1.

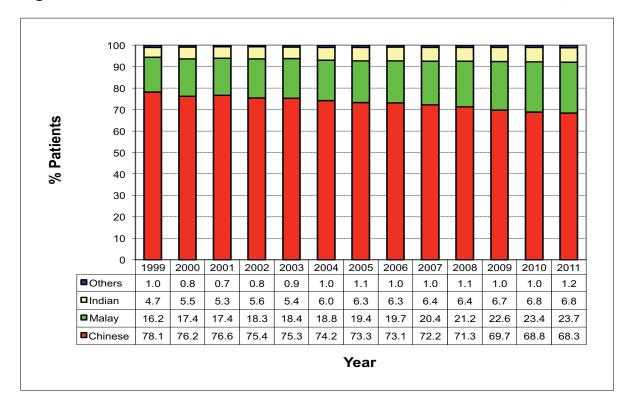


Figure 8.1.3.3.1: PREVALENT DIALYSIS PATIENTS BY ETHNIC GROUP, 1999 – 2011

The proportion of Chinese has been dropping from 78.1% in 1999 to 68.3% in 2011. During this time, the proportions of Indians (4.7 to 6.8%) and Malays (16.2 to 23.7%) have increased. In 1999, the proportion of prevalent dialysis was slightly higher in females, the trends reversed from year 2000 onwards. See Figure 8.1.3.3.2.

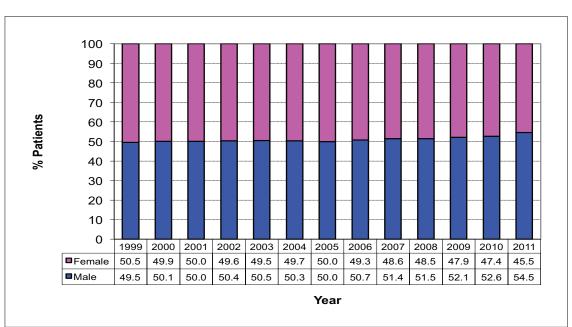


Figure 8.1.3.3.2: PREVALENT DIALYSIS PATIENTS BY GENDER, 1999 – 2011

#### 8.1.4 Mortality

There were 560 dialysis deaths (CR 148.5 pmp; ASR 108.6 pmp) in 2010. Of these deaths, 434 of them (CR 115.1 pmp; ASR 83.8 pmp) were on HD and 126 (CR 33.4 pmp; ASR 24.9 pmp) were on PD programmes prior to their demise. Mortality is further discussed in Section 8.9.

In 2011, there were 663 dialysis deaths (CR 175.0 pmp; ASR 120.8 pmp). Of these deaths, 559 of them (CR 174.9 pmp; ASR 101.9 pmp) were on HD and 104 (CR 27.4 pmp; ASR 18.8 pmp) were on PD programmes prior to their demise.

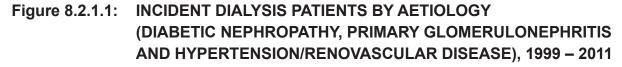
# 8.2 Aetiology of Renal Failure

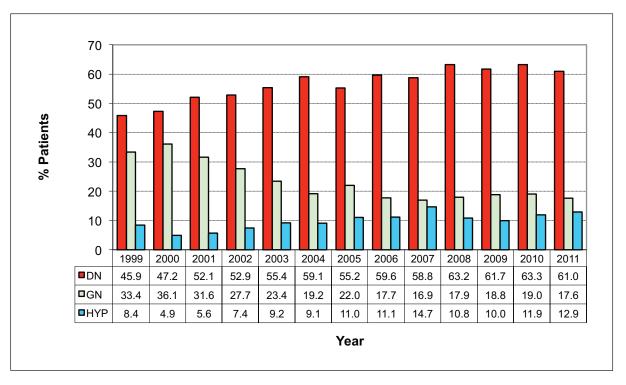
#### 8.2.1 Incident Patients

The most common cause of end-stage renal failure was diabetic nephropathy (2010 - 63.3%, 2011 - 61.0%). Primary glomerulonephritis was the second most common (2010 - 19.0%, 2011 - 17.6%) (Table 8.2.1.1).

Table 8.2.1.1: INCIDENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE

Cause of CKD5	2010		2011	
Cause of CRD3	No	%	No	%
Diabetic Nephropathy (DN)	469	63.3	551	61.0
Primary Glomerulonephritis (GN)	141	19.0	159	17.6
Autoimmune Disease/GN with Systemic Manifestations	6	8.0	9	1.0
Hypertension and Renovascular Disease (HYP)	88	11.9	117	12.9
Polycystic Kidney Disease/Other Cystic Diseases	15	2.0	20	2.2
Vesicoureteric Reflux/Chronic Pyelonephritis	0	0.0	3	0.3
Obstruction	2	0.3	8	0.9
Stone Disease	1	0.1	2	0.2
Miscellaneous	17	2.3	28	3.1
Unknown	2	0.3	7	0.8
All Causes	741	100	904	100





Among the 141 cases of primary glomerulonephritis in 2010, 37.6% (53/141) were biopsy-proven. Among the 159 cases of primary glomerulonephritis in 2011, 35.8% (57/159) were biopsy-proven. The remainder were presumptive based on evidence of small kidneys with smooth contour on ultrasound examination, proteinuria of >1 g/day, haematuria, and/or a history of "nephritis".

Causes of all biopsy-proven cases in both primary and secondary glomerulonephritis are shown in Table 8.2.1.2.

IgA Nephropathy was the most common biopsy-proven glomerulonephritis in 2010 (52.8% (28/53)).

Systemic Lupus Erythematosus comprised 83.3% of secondary glomerulonephritis in 2010 and 77.8% in 2011. It also made up 3.4% (5/147) of all glomerulonephritis (primary and secondary) in 2010 while 4.2% (7/168) in 2011.

Table 8.2.1.2: INCIDENT DIALYSIS PATIENTS BY GLOMERULONEPHRITIS

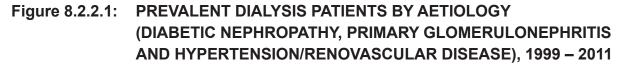
GLOMERULONEPHRITIS	2	010	20	011
GLOWEROLONEFHRITIS	No	%	No	%
Primary Glomerulonephritis (No Biopsy)				
Presumed Glomerulonephritis	88	62.4	102	64.2
Primary Glomerulonephritis (with Biopsy)				
Histology undefinable; advanced	2	1.4	1	0.6
Focal sclerosing Glomerulonephritis	18	12.8	28	17.6
IgA Nephropathy	28	19.9	18	11.3
Crescentric GN (otherwise not specified): RPGN	3	2.1	3	1.9
Membranous (epimembranous) Glomerulonephritis	1	0.7	4	2.5
Focal segmental proliferative (include focal necrosis)	0	0.0	1	0.6
GN: Minimal lesion	0	0.0	1	0.6
IgM Nephropathy	1	0.7	1	0.6
Sub-total Primary Glomerulonephritis (with Biopsy)	53	37.6	57	35.8
Total Primary Glomerulonephritis	141	100	159	100
Secondary Glomerulonephritis				
Systemic Lupus Erythematosus	5	83.3	7	77.8
Goodpastures (anti-GBM with lung involvement)	0	0.0	1	11.1
ANCA positive GN	1	16.7	0	0.0
HIV Nephropathy	0	0.0	1	11.1
Total Secondary Glomerulonephritis	6	100	9	100
All Glomerulonephritis	147	19.8	168	18.6
All Biopsy proven Glomerulonephritis	59	8.0	66	7.3
All CKD5	741		904	

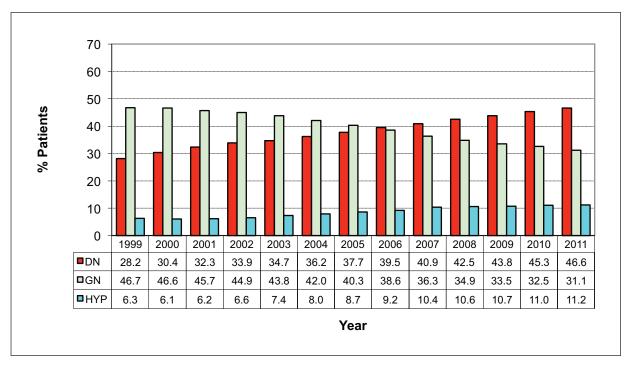
#### 8.2.2 Prevalent Patients

The commonest overall cause of CKD5 in the existing dialysis population in 2010 and 2011 was diabetic nephropathy with 45.3% and 46.6% respectively. Primary and secondary glomerulonephritis comprised 34.9% in 2010 while 33.4% in 2011.

Table 8.2.2.1: PREVALENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE

Cause of CKD5	20	10	20	11
Cause of CRDS	No	%	No	%
Diabetic Nephropathy (DN)	2081	45.3	2283	46.6
Primary Glomerulonephritis (GN)	1495	32.5	1524	31.1
Autoimmune Disease/GN with Systemic Manifestations	112	2.4	114	2.3
Hypertension and Renovascular Disease (HYP)	507	11.0	548	11.2
Polycystic Kidney Disease/Other Cystic Diseases	131	2.9	144	2.9
Vesicoureteric Reflux/Chronic Pyelonephritis	25	0.5	27	0.6
Obstruction	39	0.8	41	0.8
Stone Disease	13	0.3	13	0.3
Miscellaneous	115	2.5	124	2.5
Unknown	78	1.7	77	1.6
All Causes	4596	100	4895	100





There continues to be an increasing proportion of patients with diabetic nephropathy, and a decreasing proportion of patients with primary glomerulonephritis as the etiology.

Among the 1495 cases of primary glomerulonephritis in 2010, 1109 cases (74.2%) were not biopsy-proven. Among the 1524 cases of primary glomerulonephritis in 2011, 1112 cases (73.0%) were not biopsy-proven.

Causes of all biopsy-proven cases of both primary and secondary glomerulonephritis are shown in Table 8.2.2.2.

In 2010, IgA Nephropathy represented 57.8% (223/386) of biopsy-proven primary glomerulonephritis while this was 53.9% (222/4120 in 2011. Histologically undefinable or inconclusive cases comprised 10.1% (39/386) in 2010 and 9.05 (37/412) in 2011. Systemic Lupus Erythematosus comprised 84.8% (95/112) of secondary glomerulonephritis or 5.9% (95/1607) of all glomerulonephritis in 2010. In 2011, the corresponding figures were 83.3 (95/114) of secondary glomerulonephritis or 5.8% (95/1638) of all glomerulonephritis.

Table 8.2.2.2: PREVALENT DIALYSIS PATIENTS BY BIOPSY-PROVEN GLOMERULONEPHRITIS

GLOMERULONEPHRITIS	20	)10	20	011
GLOMEROLONEPHRITIS	No	%	No	%
Primary Glomerulonephritis (No Biopsy)				,
Presumed Glomerulonephritis	1109	74.2	1112	73.0
Primary Glomerulonephritis (with Biopsy)				
Histology undefinable; advanced	39	2.6	37	2.4
Focal sclerosing Glomerulonephritis	80	5.4	103	6.8
IgA Nephropathy	223	14.9	222	14.6
Mesangiocapillary/membranoproliferative Type I (DDD)	1	0.1	2	0.1
Membranous (epimembranous) Glomerulonephritis	13	0.9	15	1.0
Cresentic GN (otherwise not specified): RPGN	12	0.8	13	0.9
Mesangial proliferative (non IgA)	8	0.5	7	0.5
Mesangial proliferative no IMF	1	0.1	1	0.1
Focal segmental proliferative (include focal necrosis)	0	0.0	1	0.1
GN: Minimal lesion	1	0.1	2	0.1
IgM Nephropathy	7	0.5	8	0.5
Other Primary Glomerulonephritis	1	0.1	1	0.1
Sub-total Primary Glomerulonephritis (with Biopsy)	386	25.8	412	27
Total Primary Glomerulonephritis	1495	100	1524	100
Secondary Glomerulonephritis				
Henoch-Schonlein Glomerulonephritis	5	4.5	5	4.4
Goodpastures (anti-GBM with lung involvement)	5	4.5	6	5.3
Systemic Lupus Erythematosus	95	84.8	95	83.3
Wegener (extra renal granuloma proven)	2	1.8	2	1.8
ANCA positive GN	3	2.7	3	2.6
Scleroderma	1	0.9	1	0.9
HIV Nephropathy	0	0.0	1	0.9
HBsAG associated GN	1	0.9	1	0.9
Total Secondary Glomerulonephritis	112	100	114	100
All Glomerulonephritis	1607	35.0	1638	33.5
All Biopsy proven Glomerulonephritis	498	10.8	526	10.7
All CKD5	4596		4895	

Miscellaneous causes of renal failure for 2010, 2011 are listed in Table 8.2.2.3.

Table 8.2.2.3: PREVALENT DIALYSIS PATIENTS BY MISCELLANEOUS CAUSES OF RENAL FAILURE

Microllandous Course of Bourd Foilure	20	10	20	11
Miscellaneous Cause of Renal Failure	No	%	No	%
Amyloid glomerulopathy	0	0.0	1	0.8
Drug induced glomerulopathy incl heroin	1	0.9	2	1.6
Alport's disease (classical)	4	3.5	4	3.2
Analgesic nephropathy	10	8.7	12	9.7
Drug-induced interstitial nephrtis	2	1.7	1	0.8
Bladder neck obstruction (include prostatomegaly)	1	0.9	1	0.8
Congenital obstructive uropathy renal tract anomaly (unspecified)	2	1.7	3	2.4
Posterior urethral valves (obstructive nephropathy)	8	7.0	6	4.8
PUJ obstruction	2	1.7	1	0.8
Renal anomaly with spina bifida/myelomeningocoele	1	0.9	1	0.8
Renal hypoplasia/dysplasia/agenesis	14	12.2	14	11.3
Neuropathic bladder (congenital or acquired)	11	9.6	9	7.3
Renal TB	3	2.6	3	2.4
Interstitial nephritis (otherwise unspecified)	2	1.7	3	2.4
Acute cortical necrosis (otherwise unspecified)	1	0.9	0	0.0
Renal cell carcinoma	7	6.1	6	4.8
Transitional cell carcinoma	1	0.9	1	0.8
Paraproteinemia (include multiple myeloma)	3	2.6	4	3.2
Diagnosis not listed (specify)	42	36.5	52	41.9
Total	115	100	124	100

### 8.3 MODALITY

### 8.3.1 Incident Patients

In 2010, 611 patients (CR 162.0 pmp; ASR 118.6 pmp) started on HD compared with 741 patients (CR 195.6 pmp; ASR 138.6 pmp) in 2011. There were 130 new poeritoneal dialysis patients (CR 34.5 pmp; ASR 26.1 pmp) in 2010 compared with 163 patients (CR 43.0 pmp; ASR 31.1 pmp) in 2011 (Table 8.3.1.1).

Table 8.3.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY

MODALITY		20	10		2011				
WIODALITT	No	%	CR*	ASR*	No	%	CR*	ASR*	
HD	611	82.5	162.0	118.6	741	82.0	195.6	138.6	
PD	130	17.5	34.5	26.1	163	18.0	43.0	31.1	
HD+PD	741	100	196.5	144.7	904	100	238.6	169.7	

<sup>\*</sup> per million residential population

Between 1999 to 2011, there was transiently more new patients started on PD in 2002 (44.5%) compared with around 30% in other years.

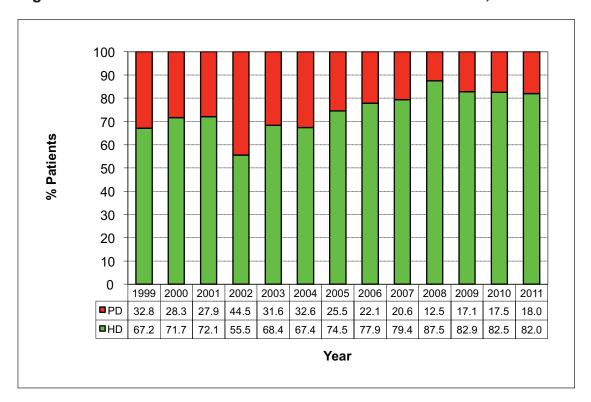


Figure 8.3.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY, 1999 – 2011

The proportion of patients on HD aged 60 years and above was 53.4% and 65.4% for those on PD in 2010. The proportion of patients on HD aged 60 years and above was 54.3% and 58.3% for those on PD in 2011 (Table 8.3.1.2).

Table 8.3.1.2: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2010

					2010					
AGE GROUP	HD				PD			HD+PD		
	No	%	CR	No	%	CR	No	%	CR	
0–19	2	0.3	2.2	1	8.0	1.1	3	0.4	3.3	
20–29	8	1.3	15.4	4	3.1	7.7	12	1.6	23.1	
30–39	21	3.4	33.9	4	3.1	6.5	25	3.4	40.4	
40–49	76	12.4	120.0	7	5.4	11.1	83	11.2	131.1	
50–59	177	29.0	320.8	29	22.3	52.6	206	27.8	373.3	
60–69	186	30.4	613.5	46	35.4	151.7	232	31.3	765.2	
70–79	101	16.5	640.5	30	23.1	190.2	131	17.7	830.7	
80+	40	6.5	578.0	9	6.9	130.1	49	6.6	708.1	
All Age Groups	611	100	162.0	130	100	34.5	741	100	196.5	

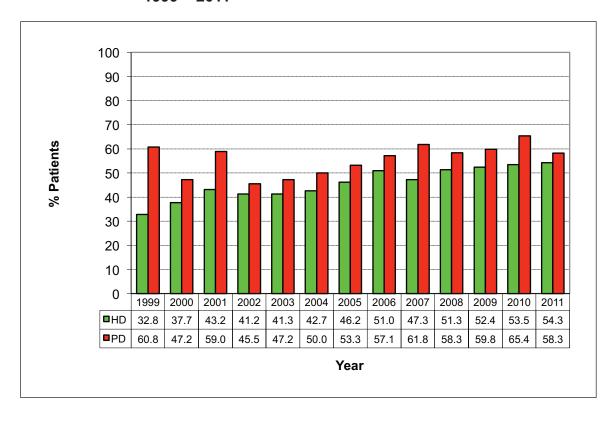
Table 8.3.1.2: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2011

					2011					
AGE GROUP	HD				PD			HD+PD		
	No	%	CR	No	%	CR	No	%	CR	
0–19	1	0.1	1.1	3	1.8	3.3	4	0.4	4.5	
20–29	9	1.2	17.4	5	3.1	9.7	14	1.5	27.0	
30–39	27	3.6	44.0	12	7.4	19.6	39	4.3	63.5	
40–49	98	13.2	155.4	9	5.5	14.3	107	11.8	169.7	
50–59	204	27.5	358.8	39	23.9	68.6	243	26.9	427.4	
60–69	218	29.4	680.2	46	28.2	143.5	264	29.2	823.7	
70–79	148	20.0	886.8	30	18.4	179.7	178	19.7	1066.5	
80+	36	4.9	491.8	19	11.7	259.6	55	6.1	751.4	
All Age Groups	741	100	195.6	163	100	43.0	904	100	238.6	

<sup>\*</sup> per million residential population

The proportion of patients on HD aged 60 years and above was 53.4% in 2010 and 54.3% in 2011. The proportion of patients on PD aged 60 years and above was 65.4% in 2010 and 58.3% in 2011 (Table 8.3.1.2).

Figure 8.3.1.2: INCIDENT PATIENTS AGED 60 YEARS AND ABOVE BY MODALITY, 1999 – 2011



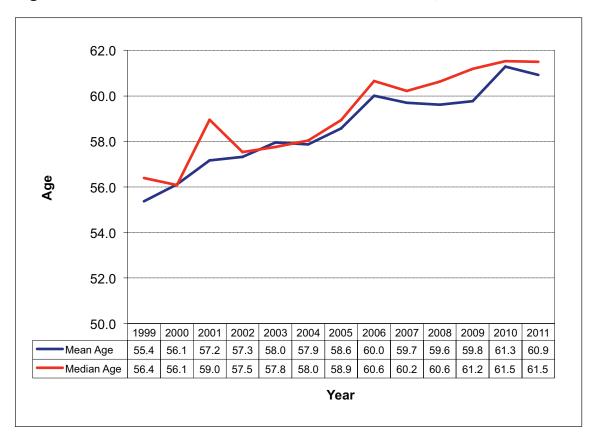
In 2010, the mean age of incident PD patients was approximately 2 years older than the incident HD patient; 63.1 (median 65.5) years compared with 60.9 (median 60.8) years while in 2011 the gap was about 1 year; PD - 61.0 (median 61.8) years compared with HD - 60.9 (median 61.5) years (Table 8.3.1.3).

Table 8.3.1.3: AGE OF INCIDENT PATIENTS BY MODALITY

MODALITY		2010		2011				
MODALITY	Mean Age	Median Age	Std Dev	Mean Age	Median Age	Std Dev		
HD	60.9	60.8	12.5	60.9	61.5	12.4		
PD	63.1	65.5	13.4	61.0	61.8	15.8		
HD+PD	61.3	61.5	12.7	60.9	61.5	13.1		

The mean age of all incident patients on dialysis increased from 55.4 years old in 1999 to 60.9 years old in 2011. See Figure 8.3.1.3.

Figure 8.3.1.3: AGE OF INCIDENT DIALYSIS PATIENTS, 1999 – 2011



In 2010, 68.5% of new patients who went on to PD had diabetic nephropathy compared with 62.2% for HD patients. There were more new HD patients with primary glomerulonephritis than new PD patients (19.5% vs 16.9%) (Table 8.3.1.4).

The trend in 2011 was similar: 65.6% of new PD patients had diabetic nephropathy compared with 59.9% of HD patients. The proportion of patients with primary glomerulonephritis was higher in HD patients than PD patients (17.8% vs 16.6%) (Table 8.3.1.4).

Table 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE AND MODALITY

		20	10			20	11	
Cause of CKD5	Н	D	PD		HD		Р	D
	No	%	No	%	No	%	No	%
Diabetic Nephropathy (DN)	380	62.2	89	68.5	444	59.9	107	65.6
Primary Glomerulonephritis (GN)	119	19.5	22	16.9	132	17.8	27	16.6
Autoimmune Disease/GN with Systemic Manifestations	6	1.0	0	0.0	6	0.8	3	1.8
Hypertension and Renovascular Disease	75	12.3	13	10.0	102	13.8	15	9.2
Polycystic Kidney Disease/Other Cystic Diseases	14	2.3	1	0.8	18	2.4	2	1.2
Vesicoureteric Reflux/Chronic Pyelonephritis	0	0.0	0	0.0	3	0.4	0	0.0
Obstruction	2	0.3	0	0.0	6	0.8	2	1.2
Stone Disease	1	0.2	0	0.0	1	0.1	1	0.6
Miscellaneous	13	2.1	4	3.1	22	3.0	6	3.7
Unknown	1	0.2	1	0.8	7	0.9	0	0.0
All Causes	611	100	130	100	741	100	163	100

The proportion of incident HD patients with diabetic nephropathy increased from 36.9% to 59.9% from 1999 to 2011. Diabetic nephropathy was the etiology of CKD5 in approximately two thirds of incident PD patients from 1999 to 2011. See Figure 8.3.1.4.

Figure 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2011

## (a) Haemodialysis

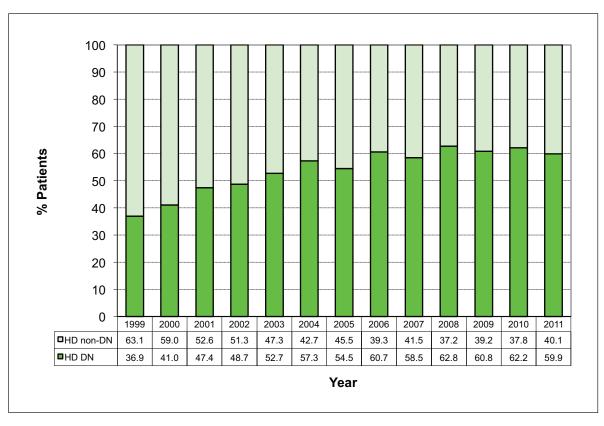
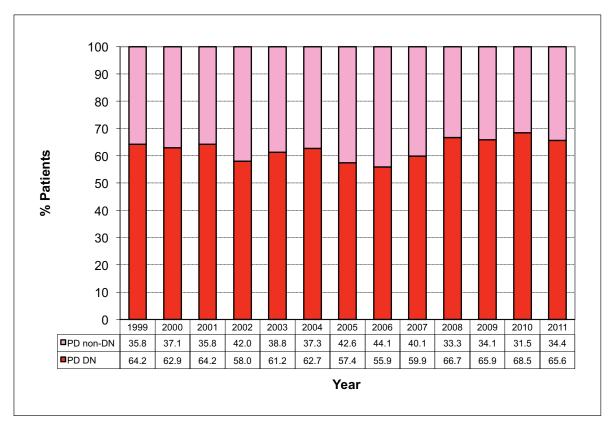


Figure 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2011

# (b) Peritoneal Dialysis



#### 8.3.2 Prevalent Patients

There were 4596 patients (CR 1218.5 pmp; ASR 896.4 pmp) on dialysis as of 31 December 2010 of which 4020 (CR 1065.8 pmp; ASR 778.4 pmp) were on HD and 576 (CR 152.7 pmp; ASR 118.0 pmp) were on PD. As of 31 Dec 2011, there were 4895 patients (CR 1291.8 pmp; ASR 919.2 pmp) on dialysis as of 31 December 2011 of which 4270 (CR 1126.9 pmp; ASR 795.2 pmp) were on HD and 625 (CR 164.9 pmp; ASR 124.0 pmp) were on PD.

Table 8.3.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY

MODALITY		20	10		2011				
	No	%	CR*	ASR*	No	%	CR*	ASR*	
HD	4020	87.5	1065.8	778.4	4270	87.2	1126.9	795.2	
PD	576	12.5	152.7	118.0	625	12.8	164.9	124.0	
HD+PD	4596	100	1218.5	896.4	4895	100	1291.8	919.2	

<sup>\*</sup> per million residential population

An increasing trend of prevalent patients was observed from 1999 till 2011. Prevalent PD patients formed 12.8% of the total dialysis population in 2011. See Figure 8.3.2.1.

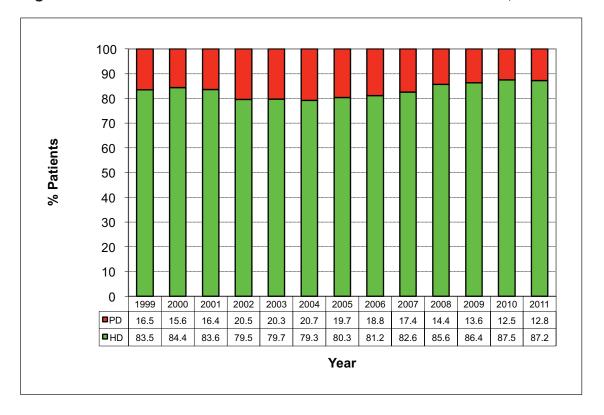


Figure 8.3.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY, 1999 – 2011

The age distribution of the prevalent dialysis patients is shown in Table 8.3.2.2.

Table 8.3.2.2: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2010

		2010									
AGE GROUP		HD			PD			HD+PD			
	No	%	CR	No	%	CR	No	%	CR		
0–19	2	0.0	2.2	15	2.6	16.3	17	0.4	18.5		
20–29	39	1.0	75.0	24	4.2	46.2	63	1.4	121.2		
30–39	164	4.1	265.1	21	3.6	33.9	185	4.0	299.1		
40–49	537	13.4	848.2	62	10.8	97.9	599	13.0	946.1		
50–59	1151	28.6	2085.9	150	26.0	271.8	1301	28.3	2357.7		
60–69	1189	29.6	3921.5	170	29.5	560.7	1359	29.6	4482.2		
70–79	746	18.6	4730.5	113	19.6	716.6	859	18.7	5447.1		
80+	192	4.8	2774.6	21	3.6	303.5	213	4.6	3078.0		
All Age Groups	4020	100	1065.8	576	100	152.7	4596	100	1218.5		

Table 8.3.2.2: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY, 2011

					2011					
AGE GROUP	HD				PD			HD+PD		
	No	%	CR	No	%	CR	No	%	CR	
0–19	1	0.0	1.1	16	2.6	17.8	17	0.3	18.9	
20–29	41	1.0	79.2	26	4.2	50.2	67	1.4	129.3	
30–39	162	3.8	263.9	23	3.7	37.5	185	3.8	301.4	
40–49	549	12.9	870.6	67	10.7	106.2	616	12.6	976.8	
50–59	1230	28.8	2163.2	142	22.7	249.7	1372	28.0	2412.9	
60–69	1274	29.8	3975.0	199	31.8	620.9	1473	30.1	4595.9	
70–79	803	18.8	4811.3	113	18.1	677.1	916	18.7	5488.3	
80+	210	4.9	2868.9	39	6.2	532.8	249	5.1	3401.6	
All Age Groups	4270	100	1126.9	625	100	164.9	4895	100	1291.8	

<sup>\*</sup> per million residential population

In 2010, the proportion of patients on HD aged 60 years and above was 53.0% compared with 52.7% for those on PD. See Table 8.3.2.2. The mean age of the patient on HD was 60.6 years (median 60.9 years) while the patient on PD was 58.8 years (median 61.2 years). See Table 8.3.2.3.

In 2011, the proportion of patients on HD aged 60 years and above was 53.5% compared with 56.1% for those on PD. See Table 8.3.2.2. The mean age of the patient on HD was 60.9 years (median 61.1 years) while the patient on PD was 59.5 years (median 62.1 years). See Table 8.3.2.3.

Table 8.3.2.3: AGE OF PREVALENT PATIENTS BY MODALITY

MODALITY		2010		2011			
WIODALITY	Mean Age	Median Age	Std Dev	Mean Age	Median Age	Std Dev	
HD	60.6	60.9	12.2	60.9	61.1	12.0	
PD	58.8	61.2	15.3	59.5	62.1	15.5	
HD+PD	60.4	60.9	12.6	60.7	61.2	12.5	

The mean age of all prevalent patients on dialysis increased from 54.5 years old in 1999 to 60.7 years old in 2011. See Figure 8.3.2.2.

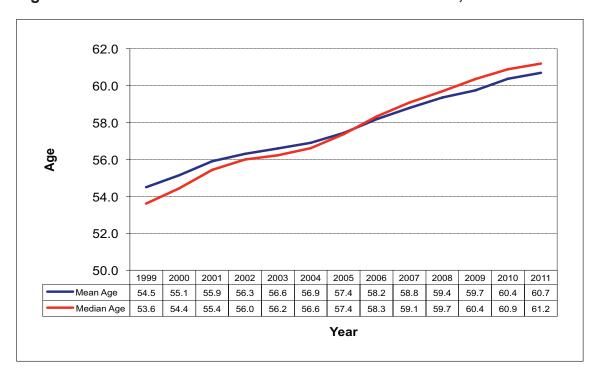


Figure 8.3.2.2: AGE OF PREVALENT DIALYSIS PATIENTS, 1999 – 2011

In 2010, 46.5% of the PD patients had diabetic nephropathy as the aetiology for renal failure compared to 45.1% of HD patients while in 2011, 50.6% of the PD patients had diabetic nephropathy as the aetiology for renal failure compared to 46.1% of HD patients. Primary glomerulonephritis was the second most common aetiology in both HD and PD patients in 2010 and 2011. See Table 8.3.2.4.

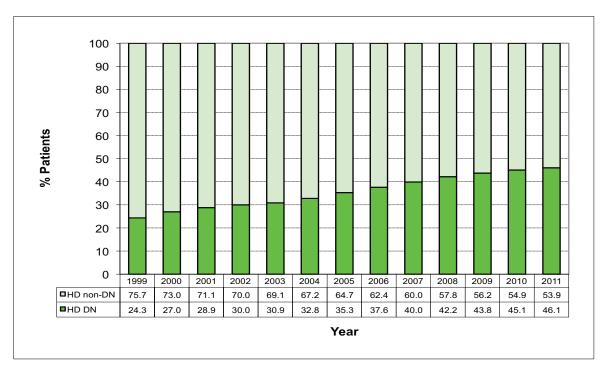
Table 8.3.2.4: PREVALENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE AND MODALITY

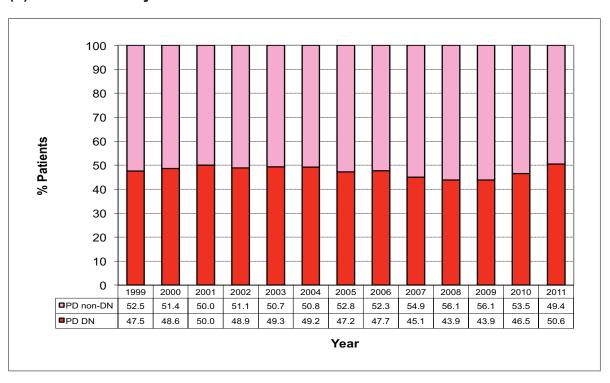
		20	10			20	11	
Cause of CKD5	Н	D	PD		Н	D	P	D
	No	%	No	%	No	%	No	%
Diabetic Nephropathy (DN)	1813	45.1	268	46.5	1967	46.1	316	50.6
Primary Glomerulonephritis (GN)	1341	33.4	154	26.7	1367	32.0	157	25.1
Autoimmune Disease/GN with Systemic Manifestations	82	2.0	30	5.2	83	1.9	31	5.0
Hypertension and Renovascular Disease	437	10.9	70	12.2	480	11.2	68	10.9
Polycystic Kidney Disease/Other Cystic Diseases	116	2.9	15	2.6	131	3.1	13	2.1
Vesicoureteric Reflux/Chronic Pyelonephritis	21	0.5	4	0.7	22	0.5	5	0.8
Obstruction	37	0.9	2	0.3	38	0.9	3	0.5
Stone Disease	12	0.3	1	0.2	11	0.3	2	0.3
Miscellaneous	92	2.3	23	4.0	102	2.4	22	3.5
Unknown	69	1.7	9	1.6	69	1.6	8	1.3
All Causes	4020	100	576	100	4270	100	625	100

Diabetic nephropathy, as a cause of CKD5, is rising among prevalent HD patients while the proportion appears to be stable in prevalent PD patients. See Figure 8.3.2.3.

Figure 8.3.2.3: PREVALENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2011

## (a) Haemodialysis





#### 8.4 Service Provider

#### 8.4.1 Incident Patients

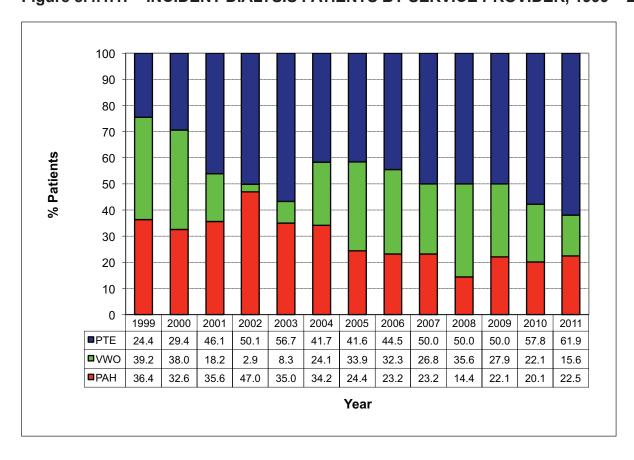
A substantial proportion of new dialysis patients went to the private centres (2010 - 57.8%, 2011 - 61.9%). Smaller proportion was dialysed in programmes at the Public Acute Hospitals (PAH), previously known as Restructured Hospitals (2010 - 20.1%, 2011 - 22.5%). The remainder went to centres run by voluntary welfare organisations (VWOs) (Table 8.4.1.1).

Table 8.4.1.1: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER

Service Provider	20	10	2011		
Service Frovider	No	%	No	%	
Public Acute Hospitals	149	20.1	203	22.5	
Voluntary Welfare Organisations	164	22.1	141	15.6	
Private Centres	428	57.8	560	61.9	
All Providers	741	100	904	100	

Except for the years 2002 and 2003, between 15%–35% of incident patients were dialysed at centres managed by voluntary welfare organisations (VWOs). Recent years show less incident patients dialysing at the VWO's. See Figure 8.4.1.1.

Figure 8.4.1.1: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER, 1999 - 2011



The age distribution of incident patients by service provider is shown in Table 8.4.1.2. The proportion of new patients aged 60 years and above was highest in the Public Acute Hospitals (2010 - 63.1%; 2011 - 57.6%).

Table 8.4.1.2: INCIDENCE AND DISTRIBUTION OF DIALYSIS PATIENTS BY AGE GROUP AND SERVICE PROVIDER

				20	10				
AGE GROUP	P/	λΗ	VV	VWO		PTE		ALL	
	No	%	No	%	No	%	No	%	
0–19	2	1.3	0	0.0	1	0.2	3	0.4	
20–29	4	2.7	3	1.8	5	1.2	12	1.6	
30–39	4	2.7	7	4.3	14	3.3	25	3.4	
40–49	11	7.4	16	9.8	56	13.1	83	11.2	
50-59	34	22.8	59	36.0	113	26.4	206	27.8	
60–69	50	33.6	59	36.0	123	28.7	232	31.3	
70–79	36	24.2	16	9.8	79	18.5	131	17.7	
80+	8	5.4	4	2.4	37	8.6	49	6.6	
All Age Groups	149	100	164	100	428	100	741	100	

	2011											
AGE GROUP	PAH		VV	VO	P.	PTE		LL				
	No	%	No	%	No	%	No	%				
0–19	4	2.0	0	0.0	0	0.0	4	0.4				
20–29	5	2.5	5	3.5	4	0.7	14	1.5				
30–39	12	5.9	3	2.1	24	4.3	39	4.3				
40–49	11	5.4	18	12.8	78	13.9	107	11.8				
50–59	54	26.6	48	34.0	141	25.2	243	26.9				
60–69	60	29.6	45	31.9	159	28.4	264	29.2				
70–79	36	17.7	17	12.1	125	22.3	178	19.7				
80+	21	10.3	5	3.5	29	5.2	55	6.1				
All Age Groups	203	100	141	100	560	100	904	100				

The mean age of the patients dialysing with the VWO centres was 59.1 years in 2010 and 59.2 in 2011. Patients in Public Acute Hospitals and private centres were older. See Table 8.4.1.3.

Table 8.4.1.3: AGE OF INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER		2010		2011				
	Mean Age	Median Age	Std Dev*	Mean Age	Median Age	Std Dev*		
Public Acute Hospitals	62.6	65.3	13.6	61.1	61.9	15.1		
Voluntary Welfare Organisations	59.1	59.3	11.0	59.2	59.8	12.1		
Private Centres	61.7	61.5	12.9	61.3	61.6	12.5		
All Providers	61.3	61.5	12.7	60.9	61.5	13.1		

<sup>\*</sup> Std Dev stands for Standard Deviation

Public Acute Hospitals did not provide much chronic outpatient HD facilities and cared for only a small proportion of new outpatient HD patients 3.8% (23/611) in 2010 and 5.7% (42/741) in 2011. Thus, majority of HD patients (96.2% in 2010; 94.3% in 2011) was dialysed in VWOs and private centres. Majority of incident PD patients were cared for by the Public Acute Hospitals; 96.9% (126/130) in 2010 and 98.8% (161/163) in 2011. See Table 8.4.1.4.

Table 8.4.1.4: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER AND MODALITY

	2010									
SERVICE PROVIDER	Н	D	Р	D	HD+PD					
	No	%	No	%	No	%				
Public Acute Hospitals	23	3.8	126	96.9	149	20.1				
Voluntary Welfare Organisations	163	26.7	1	0.8	164	22.1				
Private Centres	425	69.6	3	2.3	428	57.8				
All Providers	611	100	130	100	741	100				

	2011									
SERVICE PROVIDER	Н	D	Р	D	HD+PD					
	No	%	No	%	No	%				
Public Acute Hospitals	42	5.7	161	98.8	203	22.5				
Voluntary Welfare Organisations	141	19.0	0	0.0	141	15.6				
Private Centres	558	75.3	2	1.2	560	61.9				
All Providers	741	100	163	100	904	100				

The mean age of incident patients is shown in Table 8.4.1.5 below.

Table 8.4.1.5: AGE OF INCIDENT DIALYSIS PATIENTS BY MODALITY AND SERVICE PROVIDER

MODALI	TV		20	10		2011				
WIODALI		PAH	VWO	PTE	All	PAH	VWO	PTE	All	
	Mean	61.6	59.0	61.6	60.9	62.2	59.2	61.2	60.9	
HD	Median	63.1	59.1	61.4	60.8	63.1	59.8	61.6	61.5	
	Std. Deviation	14.9	11.0	12.9	12.5	12.3	12.1	12.5	12.4	
	Mean	62.8	68.1	74.7	63.1	60.8	_	76.8	61.0	
PD	Median	65.4	68.1	80.7	65.5	61.7	_	76.8	61.8	
	Std. Deviation	13.4	0.0	11.6	13.4	15.8	_	19.4	15.8	
	Mean	62.6	59.1	61.7	61.3	61.1	59.2	61.3	60.9	
HD+PD	Median	65.3	59.3	61.5	61.5	61.9	59.8	61.6	61.5	
	Std. Deviation	13.6	11.0	12.9	12.7	15.1	12.1	12.5	13.1	

#### 8.4.2 Prevalent Patients

Most of the prevalent dialysis patients were dialysed in centres runs by VWOs (59.3% in 2010; 56.7% in 2011). The Public Acute Hospitals dialysed 12.9% of all prevalent dialysis patients in 2010 and 13.6% in 2011. The remainder went to private dialysis centres. See Table 8.4.2.1.

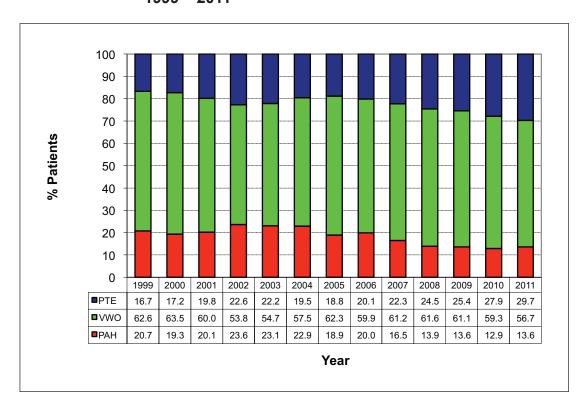
This pattern is different from that of the new patients and is probably related to the practice of dialysing temporarily in a private centre while awaiting assessment and permanent placement for dialysis in a VWO centre.

Table 8.4.2.1: PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER

Service Provider	20	10	2011		
Service Provider	No	%	No	%	
Public Acute Hospitals	591	12.9	666	13.6	
Voluntary Welfare Organisations	2724	59.3	2777	56.7	
Private Centres	1281	27.9	1452	29.7	
All Providers	4596	100	4895	100	

There was a decreasing trend in the number of prevalent patients on dialysis managed by the Public Acute Hospitals. See Figure 8.4.2.1.

Figure 8.4.2.1: PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER, 1999 – 2011



The age distribution of prevalent patients by service provider is shown in Table 8.4.2.2. The proportion of patients aged 60 years and above was highest in private centres (62.2% in 2010; 61.7% in 2011) and lowest in VWO centres (47.8% in 2010; 48.7% in 2011).

Table 8.4.2.2: DIALYSIS PATIENTS BY AGE GROUP AND SERVICE PROVIDER

				20	10			
AGE GROUP	P/	λΗ	VV	VO	P.	ΓE	ALL	
	No	%	No	%	No	%	No	%
0–19	17	2.9	0	0.0	0	0.0	17	0.4
20–29	27	4.6	30	1.1	6	0.5	63	1.4
30–39	19	3.2	119	4.4	47	3.7	185	4.0
40–49	58	9.8	407	14.9	134	10.5	599	13.0
50-59	137	23.2	867	31.8	297	23.2	1301	28.3
60–69	185	31.3	803	29.5	371	29.0	1359	29.6
70–79	121	20.5	430	15.8	308	24.0	859	18.7
80+	27	4.6	68	2.5	118	9.2	213	4.6
All Age Groups	591	100	2724	100	1281	100	4596	100

				20	)11			
AGE GROUP	PA	AH A	VV	VO	P.	ΓE	ALL	
	No	%	No	%	No	%	No	%
0–19	17	2.6	0	0.0	0	0.0	17	0.3
20–29	28	4.2	31	1.1	8	0.6	67	1.4
30–39	24	3.6	105	3.8	56	3.9	185	3.8
40–49	65	9.8	401	14.4	150	10.3	616	12.6
50-59	143	21.5	887	31.9	342	23.6	1372	28.0
60–69	219	32.9	836	30.1	418	28.8	1473	30.1
70–79	126	18.9	441	15.9	349	24.0	916	18.7
80+	126	18.9	441	15.9	349	24.0	916	18.7
All Age Groups	666	100	2777	100	1452	100	4895	100

The mean age of the prevalent patients dialysing with the VWO centres was 59.1 years in 2010 and 59.5 in 2011. Patients in private sector were the oldest (mean age 63.5 in 2010; 63.4 in 2011). See Table 8.4.2.3.

Table 8.4.2.3: AGE OF PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER		2010		2011			
SERVICE PROVIDER	Mean Age	Median Age	Std Dev	Mean Age	Median Age	Std Dev	
Public Acute Hospitals	59.3	62.1	15.8	59.9	62.9	15.6	
Voluntary Welfare Organisations	59.1	59.2	11.5	59.5	59.6	11.3	
Private Centres	63.5	63.7	12.8	63.4	64.0	12.7	
All Providers	60.4	60.9	12.6	60.7	61.2	12.5	

As in the new patients, the majority of the patients in a programme in the Public Acute Hospitals did PD (84.4% in 2010; 84.7% in 2011). Almost all VWOs and private centres offered only HD in both years. See Table 8.4.2.4.

Table 8.4.2.4: PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER AND MODALITY

	2010								
SERVICE PROVIDER	HD		Р	D	HD+PD				
	No	%	No	%	No	%			
Public Acute Hospitals	92	15.6	499	84.4	591	12.9			
Voluntary Welfare Organisations	2654	97.4	70	2.6	2724	59.3			
Private Centres	1274	99.5	7	0.5	1281	27.9			
All Providers	4020	87.5	576	12.5	4596	100			

	2011								
SERVICE PROVIDER	HD		P	D	HD+PD				
	No	%	No	%	No	%			
Public Acute Hospitals	102	15.3	564	84.7	666	13.6			
Voluntary Welfare Organisations	2722	98.0	55	2.0	2777	56.7			
Private Centres	1446	99.6	6	0.4	1452	29.7			
All Providers	4270	87.2	625	12.8	4895	100			

Private sector dialysis patients tended to have older in year 2010 and 2011. See Table 8.4.2.5.

Table 8.4.2.5: AGE OF PREVALENT DIALYSIS PATIENTS BY MODALITY AND SERVICE PROVIDER

MODALI	TV		20	10			20	11	
WODALITI		PAH	VWO	PTE	All	PAH	VWO	PTE	All
	Mean	60.5	59.2	63.5	60.6	61.6	59.5	63.4	60.9
HD	Median	61.8	59.4	63.7	60.9	63.1	59.7	64.0	61.1
	Std. Deviation	15.6	11.5	12.9	12.2	14.1	11.3	12.7	12.0
	Mean	59.1	55.8	70.6	58.8	59.6	57.0	69.9	59.5
PD	Median	62.2	55.1	65.8	61.2	62.8	55.6	65.2	62.1
	Std. Deviation	15.8	10.5	10.2	15.3	15.9	10.7	10.0	15.5
	Mean	59.3	59.1	63.5	60.4	59.9	59.5	63.4	60.7
HD+PD	Median	62.1	59.2	63.7	60.9	62.9	59.6	64.0	61.2
	Std. Deviation	15.8	11.5	12.8	12.6	15.6	11.3	12.7	12.5

#### 8.5 Co-morbid Conditions

Diabetes Mellitus is reported as a co-morbid condition, even if the cause of renal failure was not due to diabetic nephropathy.

#### 8.5.1 Incident Patients

Diabetes Mellitus as a co-morbid condition occurred in 69.9% of patients newly started on dialysis in 2010 and 67.3% in 2011. See Table 8.5.1.1.

Ischaemic Heart Disease was reported in 47.6% of patients in 2010 and 48.5% in 2011, Cerebrovascular Disease was 24.4% in 2010 and 25.1% in 2011, Peripheral Vascular Disease was 16.7% in 2010 and 16.2% in 2011.

In the above conditions, the status was not stated in 0.1% of cases.

Smoking: There were 10.3% of patients who were current smokers in 2010. Another 23.3% were former smokers. The status was unknown in 3.2% of patients. In 2011, 12.5% were current smokers while 25.1% were former smokers.

Hepatitis B Surface Antigen and anti-HCV status: In 2010, 3.6% of the patients were serologically positive for Hepatitis B Surface Antigen (HepBsAg), while in 2011 the number decreased to 3.4%. Fewer patients were positive for anti-HCV antibody (1.2% in 2010; 1.5% in 2011). Many PD patients did not have HepBsAg and anti-HCV antibody test results within the last 6 months (PD 8.5% vs HD 0.7%).

Table 8.5.1.1: INCIDENT DIALYSIS PATIENTS BY CO-MORBID CONDITIONS

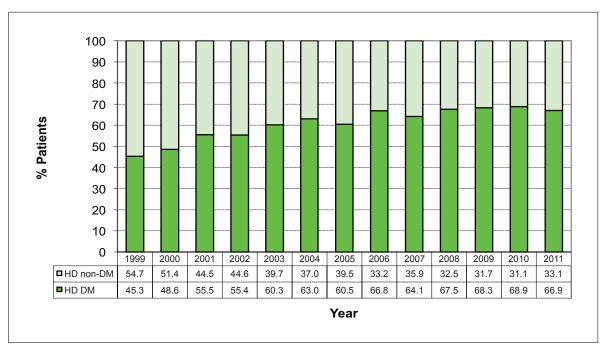
Table 8.5.1.1:												
Diabetes		_		10						11		
Mellitus		D		D		+PD		ID		D		+PD
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	421	68.9	97	74.6	518	69.9	496	66.9	112	68.7	608	67.3
No	190	31.1	33	25.4	223	30.1	243	32.8	51	31.3	294	32.5
Unknown	0	0.0	0	0.0	0	0.0	2 <b>741</b>	0.3	0	0.0	2	0.2
Total	611	100	130	100	741	100	741	100	163	100	904	100
Ischaemic			20	10					20	11		
<b>Heart Disease</b>	Н	D	Р	D	HD-	+PD	Н	ID	Р	D	HD-	+PD
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	283	46.3	70	53.8	353	47.6	355	47.9	83	50.9	438	48.5
No	328	53.7	60	46.2	388	52.4	382	51.6	80	49.1	462	51.1
Unknown	0	0.0	0	0.0	0	0.0	4	0.5	0	0.0	4	0.4
Total	611	100	130	100	741	100	741	100	163	100	904	100
Chronic			20	10					20	11		
Obstructive	Н	D		D	HD-	+PD	Н	ID		D	HD-	+PD
Airway Disease	No	%	No	_   %	No	%	No	%	No	<u>~</u>	No	%
Yes	0	0.0	1	0.8	1	0.1	1	0.1	0	0.0	1	0.1
No	62	10.1	17	13.1	79	10.7	21	2.8	8	4.9	29	3.2
Unknown	549	89.9	112	86.2	661	89.2	719	97.0	155	95.1	874	96.7
Total	611	100	130	100	741	100	741	100	163	100	904	100
	1		-	10						4.4		
Cerebrovascular	<b></b>	<u> </u>		10	ш	. DD		ID.		11		. DD
Disease		D		D		+PD		ID O/		D		+PD
V	No	%	No	%	No	%	No	%	No	%	No	%
Yes	140	22.9	41	31.5	181	24.4	179	24.2	48	29.4	227	25.1
No	471	77.1	89	68.5	560	75.6	560 2	75.6	115	70.6	675 2	74.7
Unknown	0 <b>611</b>	0.0 <b>100</b>	0 <b>130</b>	0.0 <b>100</b>	0 <b>741</b>	0.0 <b>100</b>	741	0.3 <b>100</b>	0 <b>163</b>	0.0 <b>100</b>	904	0.2 <b>100</b>
Total	011	100	130	100	/41	100	741	100	103	100	904	100
Peripheral				10						11		
Vascular Disease		D	Р	D		+PD		ID	Р	D		+PD
Vascular Disease	No	%	P No	D %	No	%	No	%	No P	D %	No	%
Vascular Disease Yes	<b>No</b> 99	<b>%</b> 16.2	No 25	<b>D</b> % 19.2	<b>No</b> 124	<b>%</b> 16.7	<b>No</b> 120	<b>%</b> 16.2	<b>No</b> 26	<b>D %</b> 16.0	<b>No</b> 146	<b>%</b> 16.2
Yes No	<b>No</b> 99 512	% 16.2 83.8	No 25 105	<b>%</b> 19.2 80.8	<b>No</b> 124 617	% 16.7 83.3	<b>No</b> 120 618	% 16.2 83.4	No 26 137	<b>%</b> 16.0 84.0	<b>No</b> 146 755	% 16.2 83.5
Yes No Unknown	<b>No</b> 99 512 0	% 16.2 83.8 0.0	No 25 105 0	% 19.2 80.8 0.0	No 124 617 0	% 16.7 83.3 0.0	No 120 618 3	% 16.2 83.4 0.4	No 26 137 0	% 16.0 84.0 0.0	No 146 755 3	% 16.2 83.5 0.3
Yes No	<b>No</b> 99 512	% 16.2 83.8	No 25 105	<b>%</b> 19.2 80.8	<b>No</b> 124 617	% 16.7 83.3	<b>No</b> 120 618	% 16.2 83.4	No 26 137	<b>%</b> 16.0 84.0	<b>No</b> 146 755	% 16.2 83.5
Yes No Unknown	No 99 512 0 <b>611</b>	% 16.2 83.8 0.0 100	P No 25 105 0 130	% 19.2 80.8 0.0	No 124 617 0	% 16.7 83.3 0.0	No 120 618 3 741	% 16.2 83.4 0.4 100	No 26 137 0 163	% 16.0 84.0 0.0 100	No 146 755 3	% 16.2 83.5 0.3
Yes No Unknown Total	No 99 512 0 <b>611</b>	% 16.2 83.8 0.0 <b>100</b>	P No 25 105 0 130	9.2 80.8 0.0 100	No 124 617 0 <b>741</b>	% 16.7 83.3 0.0 <b>100</b>	No 120 618 3 741	% 16.2 83.4 0.4 100	P No 26 137 0 163	% 16.0 84.0 0.0 100	No 146 755 3 <b>904</b>	% 16.2 83.5 0.3 <b>100</b>
Yes No Unknown Total Smoking	No 99 512 0 611	% 16.2 83.8 0.0 100	No 25 105 0 130 20 P	19.2 80.8 0.0 100	No 124 617 0 741 HD- No	% 16.7 83.3 0.0 100 +PD	No 120 618 3 741	% 16.2 83.4 0.4 100	No 26 137 0 163 20 P	16.0 84.0 0.0 100	No 146 755 3 904 HD- No	% 16.2 83.5 0.3 100 +PD
Yes No Unknown Total  Smoking  Current Smoker	No 99 512 0 611 H No 65	% 16.2 83.8 0.0 100 D % 10.6	P No 25 105 0 130 20 P No 11	19.2 80.8 0.0 100 10 D % 8.5	No 124 617 0 741 HD- No 76	% 16.7 83.3 0.0 100 +PD % 10.3	No 120 618 3 741 H No 102	% 16.2 83.4 0.4 100	P No 26 137 0 163 20 P No 11	16.0 84.0 0.0 100	No 146 755 3 904 HD- No 113	% 16.2 83.5 0.3 100 +PD % 12.5
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker	No 99 512 0 611 H No 65 147	% 16.2 83.8 0.0 100 D % 10.6 24.1	PNo 25 105 0 130 PNo 11 26	19.2 80.8 0.0 100 10 9 8.5 20.0	No 124 617 0 741 HD- No 76 173	% 16.7 83.3 0.0 100 +PD % 10.3 23.3	No 120 618 3 741 H No 102 190	% 16.2 83.4 0.4 100 D % 13.8 25.6	26 137 0 163 20 P No 11 37	16.0 84.0 0.0 100 111 D % 6.7 22.7	No 146 755 3 904 HD- No 113 227	% 16.2 83.5 0.3 100 +PD % 12.5 25.1
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker	No 99 512 0 611 H No 65 147 379	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0	PNo 25 105 0 130 PNo 11 26 89	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5	No 124 617 0 741 HD- No 76 173 468	% 16.7 83.3 0.0 100 +PD % 10.3 23.3 63.2	No 120 618 3 741 H No 102 190 424	% 16.2 83.4 0.4 100 13.8 25.6 57.2	26 137 0 163 20 P No 11 37 114	16.0 84.0 0.0 100 111 D % 6.7 22.7 69.9	No 146 755 3 904 HD- No 113 227 538	% 16.2 83.5 0.3 100 +PD % 12.5 25.1 59.5
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown	No 99 512 0 611 H No 65 147 379 20	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0 3.3	PNo 25 105 0 130 20 PNo 11 26 89 4	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1	No 124 617 0 741 HD- No 76 173 468 24	% 16.7 83.3 0.0 100 +PD % 10.3 23.3 63.2 3.2	No 120 618 3 741 H No 102 190 424 25	% 16.2 83.4 0.4 100 13.8 25.6 57.2 3.4	20 137 0 163 20 P No 11 37 114	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6	No 146 755 3 904 HD- No 113 227 538 26	% 16.2 83.5 0.3 100 +PD % 12.5 25.1 59.5 2.9
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker	No 99 512 0 611 H No 65 147 379	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0	PNo 25 105 0 130 PNo 11 26 89	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5	No 124 617 0 741 HD- No 76 173 468	% 16.7 83.3 0.0 100 +PD % 10.3 23.3 63.2	No 120 618 3 741 H No 102 190 424	% 16.2 83.4 0.4 100 13.8 25.6 57.2	26 137 0 163 20 P No 11 37 114	16.0 84.0 0.0 100 111 D % 6.7 22.7 69.9	No 146 755 3 904 HD- No 113 227 538	% 16.2 83.5 0.3 100 +PD % 12.5 25.1 59.5
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown	No 99 512 0 611 H No 65 147 379 20	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0 3.3	PNo 25 105 0 130 PNo 11 26 89 4 130	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1	No 124 617 0 741 HD- No 76 173 468 24	% 16.7 83.3 0.0 100 +PD % 10.3 23.3 63.2 3.2	No 120 618 3 741 H No 102 190 424 25	% 16.2 83.4 0.4 100 13.8 25.6 57.2 3.4	20 137 0 163 20 P No 11 37 114 1	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6	No 146 755 3 904 HD- No 113 227 538 26	% 16.2 83.5 0.3 100 +PD % 12.5 25.1 59.5 2.9
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total	No 99 512 0 611 H No 65 147 379 20 611	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0 3.3	PNo 25 105 0 130 PNo 11 26 89 4 130 20	19.2 80.8 0.0 100 10 8.5 20.0 68.5 3.1	No 124 617 0 741 HD- No 76 173 468 24 741	% 16.7 83.3 0.0 100 +PD % 10.3 23.3 63.2 3.2	No 120 618 3 741 H No 102 190 424 25 741	% 16.2 83.4 0.4 100 13.8 25.6 57.2 3.4	PNo 26 137 0 163 PNo 11 37 114 1 163 20	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100	No 146 755 3 904 HD- No 113 227 538 26 904	% 16.2 83.5 0.3 100 +PD % 12.5 25.1 59.5 2.9
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status	No 99 512 0 611 H No 65 147 379 20 611	% 16.2 83.8 0.0 100 D % 10.6 24.1 62.0 3.3 100	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo No	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100	No 124 617 0 741 HD- No 76 173 468 24 741	% 16.7 83.3 0.0 100  +PD % 10.3 23.3 63.2 3.2 100	No 120 618 3 741 H No 102 190 424 25 741	% 16.2 83.4 0.4 100  13.8 25.6 57.2 3.4 100	PNo 26 137 0 163 PNo 11 37 114 1 163 20	16.0 84.0 0.0 100 111 D % 6.7 22.7 69.9 0.6 100	No 146 755 3 904 HD- No 113 227 538 26 904	% 16.2 83.5 0.3 100  +PD % 12.5 25.1 59.5 2.9 100
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive	No 99 512 0 611 H No 65 147 379 20 611 H No 25	% 16.2 83.8 0.0 100  D % 10.6 24.1 62.0 3.3 100  D % 4.1	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 9 10	No 124 617 0 741 HD- No 76 173 468 24 741 HD- No 27	**No.3***	No 120 618 3 741 H No 102 190 424 25 741 H No 25	% 16.2 83.4 0.4 100  13.8 25.6 57.2 3.4 100  100  100  100  100  100  100  10	PNo 26 137 0 163 PNo 11 37 114 1 163 PNo 6	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D	No 146 755 3 904 HD- No 113 227 538 26 904 HD- No 31	**N
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582	% 16.2 83.8 0.0 100  D % 10.6 24.1 62.0 3.3 100  D % 4.1 95.3	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 9 9 1.5 90.0	No 124 617 0 741 HD- No 76 173 468 24 741 HD- No 27 699	**No. 16.7	No 120 618 3 741 No 102 190 424 25 741 H No 25 708	%   16.2   83.4   0.4   100	P No 26 137 0 163 P No 11 1 163 P No 6 139	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D %	No 146 755 3 904 HD- No 113 227 538 26 904 HD- No 31 847	**No. 16.2
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4	% 16.2 83.8 0.0 100   % 10.6 24.1 62.0 3.3 100   D % 4.1 95.3 0.7	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117 11	19.2 80.8 0.0 100 10 10 8.5 20.0 68.5 3.1 100 10 90.0 8.5	No 124 617 0 741 No 76 173 468 24 741 HD- No 27 699 15	**No.3***	No 120 618 3 741  No 102 190 424 25 741  H No 25 708 8	%   16.2   83.4   0.4   100	P No 26 137 0 163 P No 11 1 163 P No 6 139 18	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D	No 146 755 3 904 HD- No 113 227 538 26 904 HD- No 31 847 26	**No.2
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582	% 16.2 83.8 0.0 100  D % 10.6 24.1 62.0 3.3 100  D % 4.1 95.3	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 9 9 1.5 90.0	No 124 617 0 741 HD- No 76 173 468 24 741 HD- No 27 699	**No. 16.7	No 120 618 3 741 No 102 190 424 25 741 H No 25 708	%   16.2   83.4   0.4   100	P No 26 137 0 163 P No 11 1 163 P No 6 139	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D %	No 146 755 3 904 HD- No 113 227 538 26 904 HD- No 31 847	**No. 16.2
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4	% 16.2 83.8 0.0 100   % 10.6 24.1 62.0 3.3 100   D % 4.1 95.3 0.7	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117 11 130	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 9 1.5 90.0 8.5	No 124 617 0 741 No 76 173 468 24 741 HD- No 27 699 15	**No. 16.7	No 120 618 3 741  No 102 190 424 25 741  H No 25 708 8	%   16.2   83.4   0.4   100	PNo 26 137 0 163 PNo 11 37 114 1 163 PNo 6 139 18 163	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0	No 146 755 3 904 HD- No 113 227 538 26 904 HD- No 31 847 26	**N
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4 611	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117 11 130 20	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 9 90.0 8.5 100	No 124 617 0 741 No 76 173 468 24 741 HD- No 27 699 15 741	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741	16.2 83.4 0.4 100 100 100 100 100 100 100 100 100	PNo 26 137 0 163 PNo 11 37 114 1 163 PNo 6 139 18 163 20	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904	**No
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total	No 99 512 0 611  H No 65 147 379 20 611  H No 25 582 4 611	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 11 26 89 4 130 PNo 2 117 11 130 PP	19.2 80.8 0.0 100 10 9 8.5 20.0 68.5 3.1 100 10 90.0 8.5 100	No 124 617 0 741  HD- No 76 173 468 24 741  HD- No 27 699 15 741	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741	%   16.2   83.4   0.4   100	PNo 26 137 0 163 PNo 11 1 163 PNo 6 139 18 163 PP	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0 100	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904	**No. 16.2 **83.5 **0.3 **100 **PD **% **12.5 **25.1 **59.5 **2.9 **100 **PD **% **3.4 **93.7 **2.9 **100
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4 611	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 2 117 11 130 PNo No N	19.2 80.8 0.0 100 10 10 8.5 20.0 68.5 3.1 100 10 90.0 8.5 100 10 0	No 124 617 0 741  HD- No 76 173 468 24 741  HD- No 27 699 15 741  HD- No	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741	%   16.2   83.4   0.4   100	PNo 26 137 0 163 PNo 11 37 114 1 163 PNo 6 139 18 163 20	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0 100	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904	**No. **16.2
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4 611 H No 6	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 2 117 11 130 PNo 3	19.2 80.8 0.0 100 10 10 8.5 20.0 68.5 3.1 100 10 90.0 8.5 100 10 D	No 124 617 0 741  HD- No 76 173 468 24 741  HD- No 27 699 15 741  HD- No 9	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741  H No 13	%   16.2   83.4   0.4   100	PNo 26 137 0 163 20 PNo 6 139 18 163 20 PNo 1	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0 100	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904  HD- No 14	*** 16.2 83.5 0.3 100  **PD  *** ** ** ** ** ** ** ** ** ** ** **
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive Negative Negative Negative	No 99 512 0 611 H No 65 147 379 20 611 H No 25 582 4 611	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 2 117 11 130 PNo No N	10 10 10 10 10 10 10 10 10 10	No 124 617 0 741  HD- No 76 173 468 24 741  HD- No 27 699 15 741  HD- No 9 717	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741	%   16.2   83.4   0.4   100	PNo 26 137 0 163 PNo 6 139 18 163 PNo No PNo No PNo No PNo 11 No PNo 11 No PNo 11 No PNo PNo PNo PNo PNo PNo PNo PNo PNo	16.0   84.0   0.0   100   11   D   %   6.7   22.7   69.9   0.6   100   11   D   %   3.7   85.3   11.0   100   11   D   %   87.1	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904	**No. **1.5**  **PD**  **PD**  **PD**  ****  ****  ****  ****  ****  ****  ****
Yes No Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive	No 99 512 0 611  H No 65 147 379 20 611  H No 25 582 4 611  H No 6	%   16.2   83.8   0.0   100	PNo 25 105 0 130 PNo 2 117 11 130 PNo 3 116	19.2 80.8 0.0 100 10 10 8.5 20.0 68.5 3.1 100 10 90.0 8.5 100 10 D	No 124 617 0 741  HD- No 76 173 468 24 741  HD- No 27 699 15 741  HD- No 9	**No. 16.7	No 120 618 3 741  H No 102 190 424 25 741  H No 25 708 8 741  H No 13 719	%   16.2   83.4   0.4   100	P No 26 137 0 163 P No 6 139 18 163 P No 1 1 142	16.0 84.0 0.0 100 11 D % 6.7 22.7 69.9 0.6 100 11 D % 3.7 85.3 11.0 100	No 146 755 3 904  HD- No 113 227 538 26 904  HD- No 31 847 26 904  HD- No 14 861	*** 16.2 83.5 0.3 100  **PD  *** ** ** ** ** ** ** ** ** ** ** **

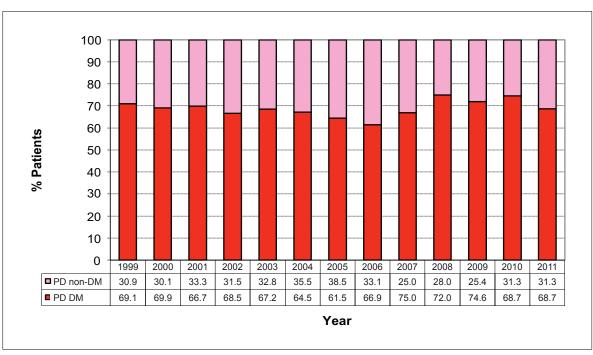
Patients on PD had a higher proportion of patients with diabetes mellitus, ischaemic heart disease and cerebrovascular disease as well as peripheral vascular disease compared with patients on HD. See Table 8.5.1.1.

The proportion of incident patients on HD with diabetes as co-morbidity has increased over the years (45.3% in 1999, 66.9% in 2011) while that for PD fluctuated from 61.5% to 75.0% for the period 1999 to 2011. See Figure 8.5.1.1.

Figure 8.5.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY AND DIABETES MELLITUS, 1999 – 2011

# (a) Haemodialysis

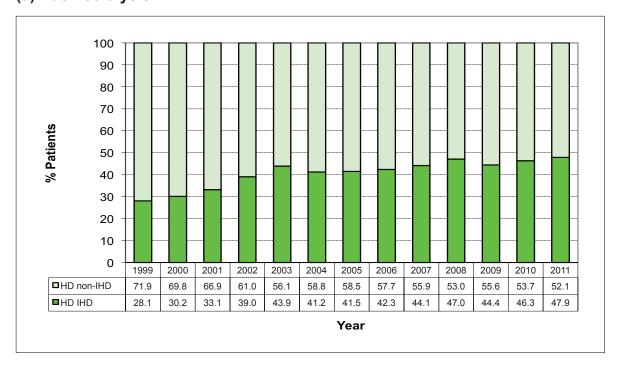


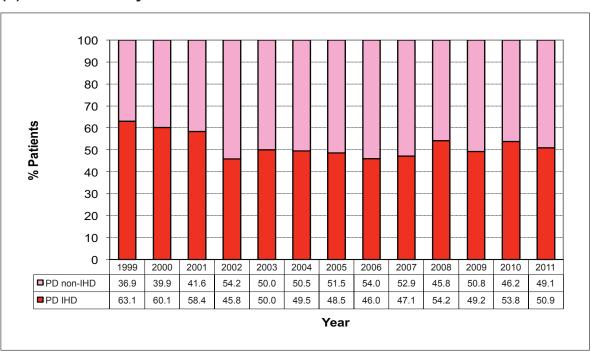


The proportion of incident dialysis patients having ischaemic heart disease as co-morbidity was rising for HD (28.1% in 1999, 47.9% in 2011). There was a decrease in the proportion of PD patients having ischaemic heart disease as co-morbidity from 1999 to 2002 but the proportion has risen with little variation around 50%. See Figure 8.5.1.2.

Figure 8.5.1.2: INCIDENT DIALYSIS PATIENTS BY MODALITY AND ISCHAEMIC HEART DISEASE, 1999 – 2011

## (a) Haemodialysis

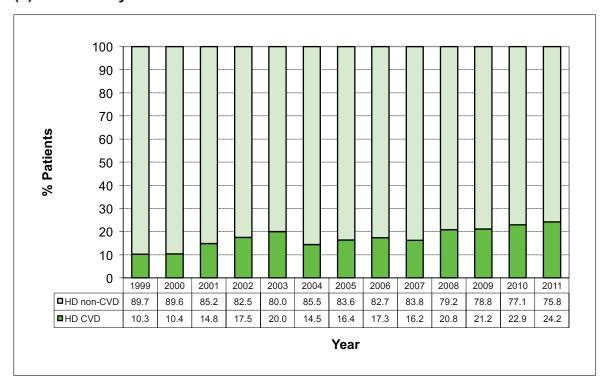


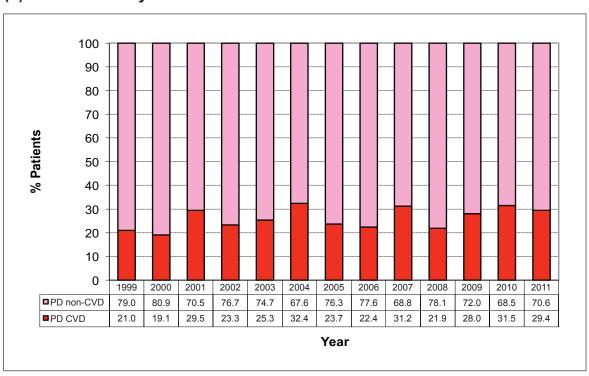


The proportion of incident dialysis patients having cerebrovascular disease as co-morbidity fluctuated between 10.3% and 24.2% for HD; and between 19.1% and 32.4% for PD. See Figure 8.5.1.3.

Figure 8.5.1.3: INCIDENT DIALYSIS PATIENTS BY MODALITY AND CEREBROVASCULAR DISEASE, 1999 – 2011

# (a) Haemodialysis

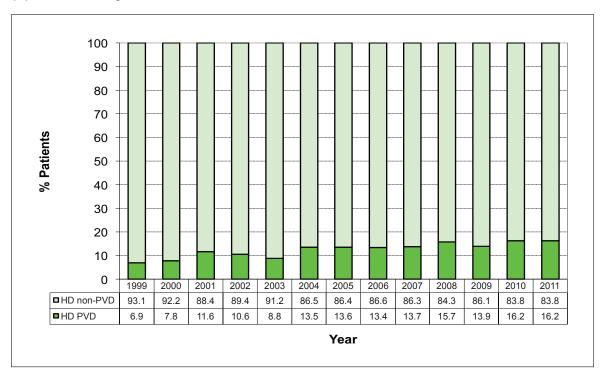


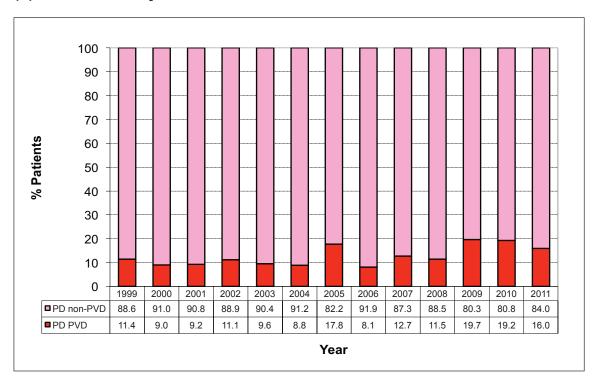


Peripheral vascular disease as co-morbidity increased from 6.9% in 1999 to 16.2% in 2011 for incident HD patients while that for PD was between 8.1% and 19.7% for the same period. See Figure 8.5.1.4.

Figure 8.5.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND PERIPHERAL VASCULAR DISEASE, 1999 – 2011

## (a) Haemodialysis





#### 8.5.2 Prevalent Patients

Diabetes Mellitus was present in 52.9% of prevalent patients in 2010 and 54.5% in 2011.

Ischaemic heart disease was present in 44.7% in 2010 and 45.7% in 2011, cerebrovascular disease 18.8% of prevalent patients in 2010 and 19.7% in 2011. See Table 8.5.2.1.

Smoking: There were 9.0% of patients who were current smokers in 2010 and 9.7% in 2011. Former smokers were 22.5% in 2010 and 23.1% in 2011.

Hepatitis B surface antigen and anti-HCV status: Hepatitis B Surface Antigen positivity was found in 3.9% of patients in 2010 and 4.0% in 2011. Anti-HCV antibody positive status was present in 3.8% of patients in 2010 and 4.2% in 2011.

Table 8.5.2.1: PREVALENT DIALYSIS PATIENTS BY CO-MORBID CONDITIONS

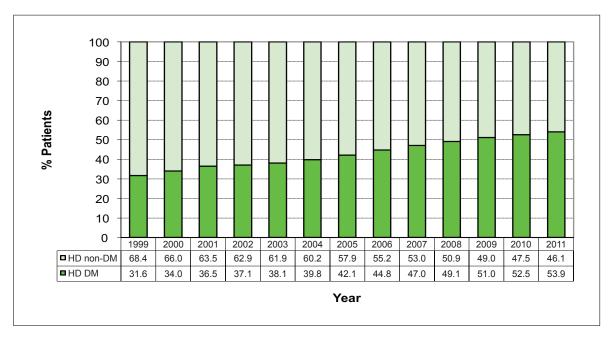
Diabetes	<u> </u>			10					20			
Mellitus		D		D	HD-		Н Н			D	HD-	
\ <u>'</u>	No	%	No	%	No	%	No	%	No	%	No	%
Yes	2112	52.5	321	55.7	2433	52.9	2303	53.9	366	58.6	2669	54.5
No	1908	47.5	255	44.3	2163	47.1	1966	46.0	259	41.4	2225	45.5
Unknown	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0
Total	4020	100	576	100	4596	100	4270	100	625	100	4895	100
Ischaemic			20	10					20	11		
<b>Heart Disease</b>	H	D	Р	D	HD-		Н		Р	D	HD+	+PD
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	1809	45.0	244	42.4	2053	44.7	1954	45.8	285	45.6	2239	45.7
No	2211	55.0	332	57.6	2543	55.3	2314	54.2	339	54.2	2653	54.2
Unknown	0	0.0	0	0.0	0	0.0	2	0.0	1	0.2	3	0.1
Total	4020	100	576	100	4596	100	4270	100	625	100	4895	100
Chronic			20	10					20	)11		
Obstructive	Н	D		D	HD-	-PD	Н	D		D	HD+	-PD
Airway Disease	No	%	No	_   %	No	%	No	%	No	<u> </u>	No	%
Yes	140	3.5	15	2.6	155	3.4	118	2.8	12	1.9	130	2.7
No	3295	82.0	430	74.7	3725	81.0	2992	70.1	348	55.7	3340	68.2
Unknown	585	14.6	131	22.7	716	15.6	1160	27.2	265	42.4	1425	29.1
Total	4020	100	576	100	4596	100	4270	100	625	100	4895	100
	1020	100			.550	100		.00			.000	100
Cerebrovascular			20						20			
Disease		D		D	HD-		Н			D	HD+	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	736	18.3	130	22.6	866	18.8	817	19.1	147	23.5	964	19.7
No	3284	81.7	446	77.4	3730	81.2	3452	80.8	478	76.5	3930	80.3
Unknown	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	0.0
Total	4020	100	576	100	4596	100	4270	100	625	100	4895	100
Peripheral			20	10					20	11		
Vascular Disease	П	D		D	HD-	-PD	Н	D		D	HD+	-PD
. dood a Discase	No	%	No	<b>%</b>	No	%	No	%	No	<b>%</b>	No	%
Yes	564	14.0	69	12.0	633	13.8	653	15.3	86	13.8	739	15.1
No				U	, 555						1.79	
		86.0	507	88.0	3963							
	3456	86.0	507	88.0	3963	86.2	3615	84.7	539	86.2	4154	84.9
Unknown	3456 0	0.0	0	0.0	0	86.2 0.0	3615 2	84.7 0.0	539 0	86.2 0.0	4154 2	84.9 0.0
Unknown <b>Total</b>	3456		0 <b>576</b>	0.0 <b>100</b>		86.2	3615	84.7	539 0 <b>625</b>	86.2 0.0 <b>100</b>	4154	84.9
Unknown	3456 0 <b>4020</b>	0.0 <b>100</b>	0 <b>576</b> <b>20</b>	0.0 <b>100</b>	0 <b>4596</b>	86.2 0.0 <b>100</b>	3615 2 <b>4270</b>	84.7 0.0 <b>100</b>	539 0 <b>625</b>	86.2 0.0 100	4154 2 4895	84.9 0.0 <b>100</b>
Unknown <b>Total</b>	3456 0 <b>4020</b>	0.0 100	0 <b>576</b> <b>20</b> P	0.0 100 10 D	0 <b>4596</b> HD-	86.2 0.0 <b>100</b> <b>+PD</b>	3615 2 <b>4270</b> H	84.7 0.0 <b>100</b>	539 0 <b>625</b> 20	86.2 0.0 100	4154 2 4895 HD-	84.9 0.0 <b>100</b> <b>+PD</b>
Unknown Total Smoking	3456 0 4020 H No	0.0 100 D	0 576 20 P	0.0 100 10 D	0 4596 HD- No	86.2 0.0 100 PPD %	3615 2 4270 H No	84.7 0.0 <b>100</b> <b>D</b>	539 0 <b>625</b> 20 P	86.2 0.0 100	4154 2 4895 HD-	84.9 0.0 <b>100</b> <b>+PD</b>
Unknown Total Smoking Current Smoker	3456 0 4020 H No 374	0.0 100 D % 9.3	0 576 20 P No 40	0.0 100 10 D % 6.9	0 4596 HD- No 414	86.2 0.0 <b>100</b> <b>+PD</b> % 9.0	3615 2 4270 H No 434	84.7 0.0 <b>100</b> <b>D</b> % 10.2	539 0 <b>625</b> 20 P No 43	86.2 0.0 100 11 D % 6.9	4154 2 4895 HD- No 477	84.9 0.0 <b>100</b> <b>PPD</b> % 9.7
Unknown Total Smoking Current Smoker Ex-Smoker	3456 0 4020 H No 374 929	0.0 100 D % 9.3 23.1	0 576 20 P No 40 103	0.0 100 10 D % 6.9 17.9	0 4596 HD- No 414 1032	86.2 0.0 100 +PD % 9.0 22.5	3615 2 4270 H No 434 1010	84.7 0.0 100 D % 10.2 23.7	539 0 <b>625</b> <b>20</b> <b>P</b> <b>No</b> 43 121	86.2 0.0 100 11 D % 6.9 19.4	4154 2 4895 HD- No 477 1131	84.9 0.0 <b>100</b> <b>PPD</b> % 9.7 23.1
Unknown Total Smoking Current Smoker Ex-Smoker Non-Smoker	3456 0 4020 H No 374 929 2687	0.0 100 D % 9.3 23.1 66.8	0 576 20 P No 40 103 425	0.0 100 10 D % 6.9 17.9 73.8	0 4596 HD- No 414 1032 3112	86.2 0.0 <b>100</b> <b>PPD</b> % 9.0 22.5 67.7	3615 2 4270 H No 434 1010 2782	84.7 0.0 100 D % 10.2 23.7 65.2	539 0 <b>625</b> <b>20</b> <b>P</b> <b>No</b> 43 121 456	86.2 0.0 100 11 D % 6.9 19.4 73.0	4154 2 4895 No 477 1131 3238	84.9 0.0 100 PPD % 9.7 23.1 66.1
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown	3456 0 4020 H No 374 929 2687 30	0.0 100 9.3 23.1 66.8 0.7	0 576 20 P No 40 103 425 8	0.0 100 10 D % 6.9 17.9 73.8	0 4596 No 414 1032 3112 38	86.2 0.0 <b>100</b> <b>PPD</b> % 9.0 22.5 67.7 0.8	3615 2 4270 H No 434 1010 2782 44	84.7 0.0 100 D % 10.2 23.7 65.2 1.0	539 0 <b>625</b> <b>20</b> <b>P</b> <b>No</b> 43 121 456 5	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8	4154 2 4895 No 477 1131 3238 49	84.9 0.0 <b>100</b> <b>PPD</b> % 9.7 23.1 66.1 1.0
Unknown Total Smoking Current Smoker Ex-Smoker Non-Smoker	3456 0 4020 H No 374 929 2687	0.0 100 D % 9.3 23.1 66.8	0 576 20 P No 40 103 425	0.0 100 10 D % 6.9 17.9 73.8	0 4596 HD- No 414 1032 3112	86.2 0.0 <b>100</b> <b>PPD</b> % 9.0 22.5 67.7	3615 2 4270 H No 434 1010 2782	84.7 0.0 100 D % 10.2 23.7 65.2	539 0 <b>625</b> <b>20</b> <b>P</b> <b>No</b> 43 121 456	86.2 0.0 100 11 D % 6.9 19.4 73.0	4154 2 4895 No 477 1131 3238	84.9 0.0 100 PPD % 9.7 23.1 66.1
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown	3456 0 4020 H No 374 929 2687 30	0.0 100 9.3 23.1 66.8 0.7	0 576 20 P No 40 103 425 8 576	0.0 100 10 D % 6.9 17.9 73.8 1.4 100	0 4596 No 414 1032 3112 38	86.2 0.0 <b>100</b> <b>PPD</b> % 9.0 22.5 67.7 0.8	3615 2 4270 H No 434 1010 2782 44 4270	84.7 0.0 100 0 0 10.2 23.7 65.2 1.0	539 0 625 P No 43 121 456 5 625	86.2 0.0 100 111 D % 6.9 19.4 73.0 0.8 100	4154 2 4895 No 477 1131 3238 49	84.9 0.0 <b>100</b> <b>PPD</b> % 9.7 23.1 66.1 1.0
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total	3456 0 4020 H No 374 929 2687 30 4020	0.0 100 0 0 9.3 23.1 66.8 0.7	0 576 20 P No 40 103 425 8 576	0.0 100 10 D % 6.9 17.9 73.8 1.4 100	0 4596 No 414 1032 3112 38 4596	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100	3615 2 4270 H No 434 1010 2782 44 4270	84.7 0.0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	539 0 625 P No 43 121 456 5 625	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100	4154 2 4895 No 477 1131 3238 49	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100
Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status	3456 0 4020 H No 374 929 2687 30 4020	0.0 100	0 576 20 P No 40 103 425 8 576	0.0 100 10 D % 6.9 17.9 73.8 1.4 100	0 4596 No 414 1032 3112 38 4596	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100	3615 2 4270 H No 434 1010 2782 44 4270	84.7 0.0 100 0 0 10.2 23.7 65.2 1.0	539 0 625 P No 43 121 456 5 625	86.2 0.0 100 111 D % 6.9 19.4 73.0 0.8 100	4154 2 4895 No 477 1131 3238 49 4895	84.9 0.0 100 *PD % 9.7 23.1 66.1 1.0
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis	3456 0 4020 H No 374 929 2687 30 4020 H No 165	0.0 100 0 0 9.3 23.1 66.8 0.7	0 576 P No 40 103 425 8 576 P No 14	0.0 100 10 D % 6.9 17.9 73.8 1.4 100	0 4596 No 414 1032 3112 38 4596 HD- No 179	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100	3615 2 4270 H No 434 1010 2782 44 4270 H No 180	84.7 0.0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	539 0 625 P No 43 121 456 5 625 P No 14	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100	4154 2 4895 No 477 1131 3238 49 4895	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100
Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status	3456 0 4020 H No 374 929 2687 30 4020	0.0 100 % 9.3 23.1 66.8 0.7 100	0 576 20 P No 40 103 425 8 576 20 P	0.0 100 10 D % 6.9 17.9 73.8 1.4 100	0 4596 No 414 1032 3112 38 4596	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100 **PD	3615 2 4270 H No 434 1010 2782 44 4270 H No 180 4087	84.7 0.0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	539 0 625 P No 43 121 456 5 625	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6	4154 2 4895 No 477 1131 3238 49 4895	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive	3456 0 4020 H No 374 929 2687 30 4020 H No 165	0.0 100 % 9.3 23.1 66.8 0.7 100	0 576 P No 40 103 425 8 576 P No 14	0.0 100 10 D % 6.9 17.9 73.8 1.4 100 D % 2.4	0 4596 No 414 1032 3112 38 4596 HD- No 179	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100 **PD % 3.9	3615 2 4270 H No 434 1010 2782 44 4270 H No 180	84.7 0.0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	539 0 625 P No 43 121 456 5 625 P No 14	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D	4154 2 4895 No 477 1131 3238 49 4895 HD- No 194	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0
Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852	0.0 100 9.3 23.1 66.8 0.7 100 D % 4.1 95.8	0 576 P No 40 103 425 8 576 P No 14 543	0.0 100 10 D % 6.9 17.9 73.8 1.4 100 10 D % 2.4 94.3	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100 **PD % 3.9 95.6	3615 2 4270 H No 434 1010 2782 44 4270 H No 180 4087	84.7 0.0 100 0 0 0 10.2 23.7 65.2 1.0 100 0 4.2 95.7	539 0 625 P No 43 121 456 5 625 P No 14 579	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6	4154 2 4895 No 477 1131 3238 49 4895 HD- No 194 4666	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total Hepatitis BsAg Status  Positive Negative Unknown Total	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3	0.0 100 9.3 23.1 66.8 0.7 100 D % 4.1 95.8 0.1	0 576 20 P No 40 103 425 8 576 20 P No 14 543 19 576	0.0 100 100 % 6.9 17.9 73.8 1.4 100 10 D % 2.4 94.3 3.3 100	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100 **PD % 3.9 95.6 0.5	3615 2 4270 H No 434 1010 2782 44 4270 H No 180 4087 3	84.7 0.0 100 100 0 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1	539 0 625 No 43 121 456 5 625 No 14 579 32 625	86.2 0.0 100 111 D % 6.9 19.4 73.0 0.8 100 111 D % 2.2 92.6 5.1 100	4154 2 4895 No 477 1131 3238 49 4895 HD-1 No 194 4666 35	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020	0.0 100 9.3 23.1 66.8 0.7 100 0 4.1 95.8 0.1	0 576 20 P No 40 103 425 8 576 20 P No 14 543 19 576	0.0 100 100 % 6.9 17.9 73.8 1.4 100 10 D % 2.4 94.3 3.3 100	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596	86.2 0.0 100 **PD % 9.0 22.5 67.7 0.8 100 **PD % 3.9 95.6 0.5 100	3615 2 4270 No 434 1010 2782 44 4270 H No 180 4087 3 4270	84.7 0.0 100 100 % 10.2 23.7 65.2 1.0 100 D % 4.2 95.7 0.1	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625 20	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100	HD-1 No 477 1131 3238 49 4895  HD-1 No 194 4666 35 4895	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7 100
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total Hepatitis BsAg Status  Positive Negative Unknown Total	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020	0.0 100 9.3 23.1 66.8 0.7 100 D 4.1 95.8 0.1 100	0 576 P No 40 103 425 8 576 P No 14 543 19 576 20 P	0.0 100 100 % 6.9 17.9 73.8 1.4 100 10 D % 2.4 94.3 3.3 100 10	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596	86.2 0.0 100 **PD  % 9.0 22.5 67.7 0.8 100  **PD  % 3.9 95.6 0.5 100	3615 2 4270 H No 434 1010 2782 44 4270 H No 180 4087 3 4270	84.7 0.0 100 100 % 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1 100	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100	4154 2 4895 No 477 1131 3238 49 4895 HD-1 4666 35 4895	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7 100
Unknown Total  Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020	0.0 100  % 9.3 23.1 66.8 0.7 100  D % 4.1 95.8 0.1 100	0 576 20 P No 40 103 425 8 576 P No 14 543 19 576 20 P No	0.0 100 10 D % 6.9 17.9 73.8 1.4 100 D % 2.4 94.3 3.3 100 D %	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596	86.2 0.0 100 **PD  % 9.0 22.5 67.7 0.8 100  **PD  % 3.9 95.6 0.5 100  **PD %	3615 2 4270  H No 434 1010 2782 44 4270  H No 180 4087 3 4270  H No	84.7 0.0 100 100 0 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1 100 0	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625 P No	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100 11 D	HD- No 477 1131 3238 49 4895 HD- No 194 4666 35 4895	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7 100 **PD %
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020 H No 168	0.0 100  % 9.3 23.1 66.8 0.7 100  D % 4.1 95.8 0.1 100  D % 4.2	0 576 20 P No 40 103 425 8 576 P No 14 543 19 576 P No 7	0.0 100 10 D % 6.9 17.9 73.8 1.4 100 D % 2.4 94.3 3.3 100 D % 1.2	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596 HD- No 175	86.2 0.0 100 **PD  % 9.0 22.5 67.7 0.8 100  **PD  % 3.9 95.6 0.5 100  **PD  % 3.8	3615 2 4270  H No 434 1010 2782 44 4270  H No 180 4087 3 4270  H No 197	84.7 0.0 100 100 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1 100 0 4.6	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625 P No 7	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100 11 D	HD- No 477 1131 3238 49 4895 HD- No 194 4666 35 4895 HD- No 204	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7 100 **PD % 4.2
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive Negative Negative	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020 H No 168 3848	0.0 100  % 9.3 23.1 66.8 0.7 100   % 4.1 95.8 0.1 100  D % 4.2 95.7	0 576 20 P No 40 103 425 8 576 P No 14 543 19 576 20 P No 7	0.0 100 10 D % 6.9 17.9 73.8 1.4 100  10 D % 2.4 94.3 3.3 100  10 D % 1.2 95.3	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596 HD- No 175 4397	86.2 0.0 100 100 PPD % 9.0 22.5 67.7 0.8 100 PPD % 3.9 95.6 0.5 100 PPD % 3.8 95.7	3615 2 4270  H No 434 1010 2782 44 4270  H No 180 4087 3 4270  H No 197 4068	84.7 0.0 100 100 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1 100 0 4.6 95.3	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625 P No 7 583	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100 11 D % 1.1 93.3	HD- No 477 1131 3238 49 4895 HD- No 194 4666 35 4895 HD- No 204 4651	84.9 0.0 100 PPD % 9.7 23.1 66.1 1.0 100 PPD % 4.0 95.3 0.7 100 PPD % 4.2 95.0
Unknown Total Smoking  Current Smoker Ex-Smoker Non-Smoker Unknown Total  Hepatitis BsAg Status  Positive Negative Unknown Total  Anti-HCV Status  Positive	3456 0 4020 H No 374 929 2687 30 4020 H No 165 3852 3 4020 H No 168	0.0 100  % 9.3 23.1 66.8 0.7 100  D % 4.1 95.8 0.1 100  D % 4.2	0 576 20 P No 40 103 425 8 576 P No 14 543 19 576 P No 7	0.0 100 10 D % 6.9 17.9 73.8 1.4 100 D % 2.4 94.3 3.3 100 D % 1.2	0 4596 No 414 1032 3112 38 4596 HD- No 179 4395 22 4596 HD- No 175	86.2 0.0 100 **PD  % 9.0 22.5 67.7 0.8 100  **PD  % 3.9 95.6 0.5 100  **PD  % 3.8	3615 2 4270  H No 434 1010 2782 44 4270  H No 180 4087 3 4270  H No 197	84.7 0.0 100 100 10.2 23.7 65.2 1.0 100 0 4.2 95.7 0.1 100 0 4.6	539 0 625 P No 43 121 456 5 625 P No 14 579 32 625 P No 7	86.2 0.0 100 11 D % 6.9 19.4 73.0 0.8 100 11 D % 2.2 92.6 5.1 100 11 D	HD- No 477 1131 3238 49 4895 HD- No 194 4666 35 4895 HD- No 204	84.9 0.0 100 **PD % 9.7 23.1 66.1 1.0 100 **PD % 4.0 95.3 0.7 100 **PD % 4.2

Patients with diabetes mellitus were higher in proportion among those on PD as compared with HD (55.7% vs 52.5% in 2010; 58.6% vs 53.9% in 2011) and cerebrovascular disease (22.6% vs 18.3% in 2010; 23.5% vs 19.1% in 2011).

An increasing proportion of HD patients, 31.6% in 1999 compared to 53.9% in 2011, have diabetes whereas the proportion for PD patients has been stable. See Figure 8.5.2.1. Similar trends have been noted for ischaemic heart disease as a co-morbid condition. See Figure 8.5.2.2.

Figure 8.5.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY AND DIABETES MELLITUS, 1999 – 2011

## (a) Haemodialysis



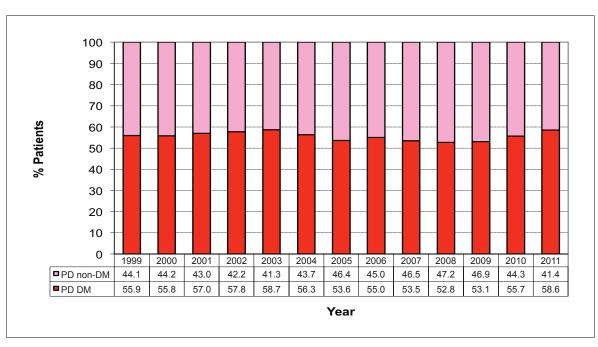
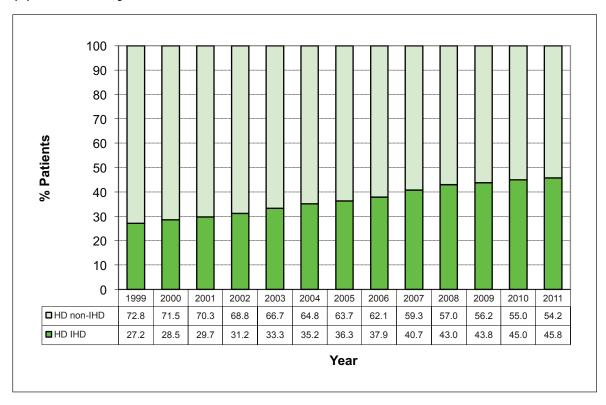
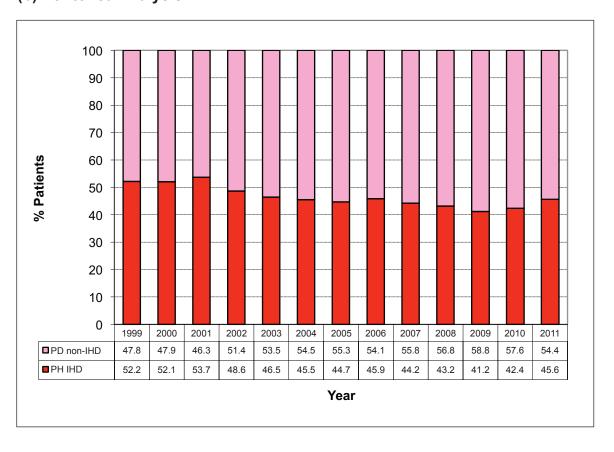


Figure 8.5.2.2: PREVALENT DIALYSIS PATIENTS BY MODALITY AND ISCHAEMIC HEART DISEASE, 1999 – 2011

# (a) Haemodialysis

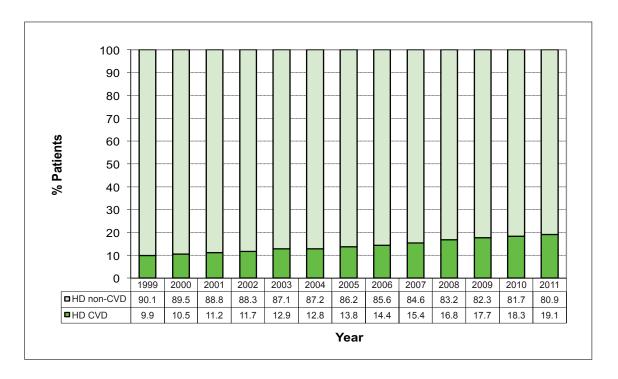


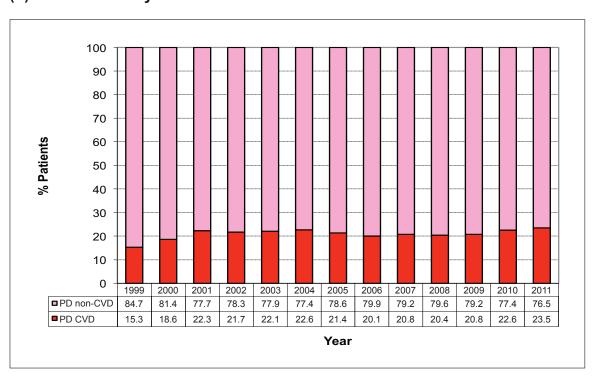


There was a similar rising trend in the prevalent HD patients for cerebrovascular disease as co-morbid condition (9.9% in 1999 to 19.1% in 2011). The proportion for patients on PD increased from 15.3% to 22.3% in 2001, before hovering between 20.1% - 23.5% in the period 2002 - 2011. See Figure 8.5.2.3.

Figure 8.5.2.3: PREVALENT DIALYSIS PATIENTS BY MODALITY, CEREBROVASCULAR DISEASE, 1999 – 2011

### (a) Haemodialysis

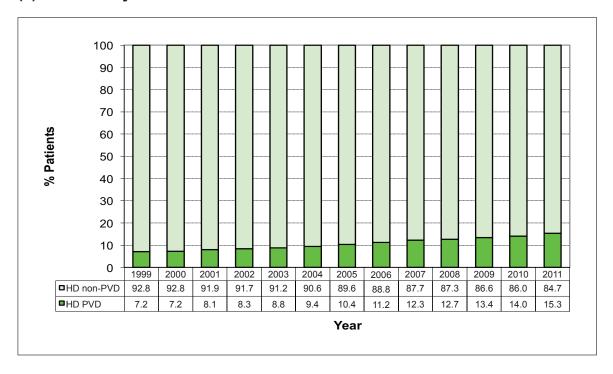


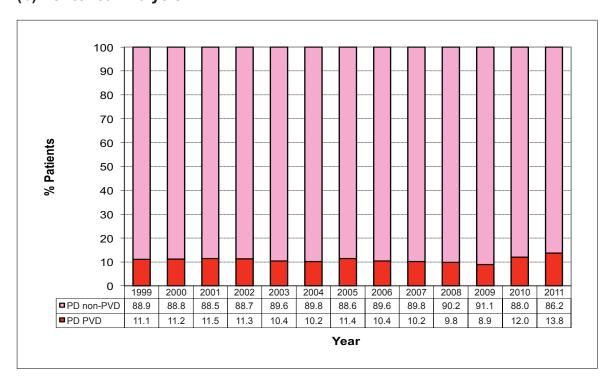


The proportion of prevalent patients having peripheral vascular disease as co-morbid condition was small for the period 1999–2011 (7.2% – 15.3% for HD, 8.9% – 13.8% for PD). See Figure 8.5.2.4.

Figure 8.5.2.4: PREVALENT DIALYSIS PATIENTS BY MODALITY AND PERIPHERAL VASCULAR DISEASE, 1999 – 2011

# (a) Haemodialysis





### 8.6 Social Aspects

#### 8.6.1 Educational Level

#### 8.6.1.1 Incident Patients

The incident dialysis patients who had no formal education were 16.5% in 2010 and 11.5% in 2011. See Table 8.6.1.1.1.

Table 8.6.1.1.1: INCIDENT DIALYSIS PATIENTS BY EDUCATIONAL LEVEL

EDUCATIONAL LEVEL	20	10	20	11
EDOCATIONAL LEVEL	No	%	No	%
No formal education	122	16.5	104	11.5
Low primary	189	25.5	243	26.9
PSLE Certificate	187	25.2	183	20.2
GCE N level passes	7	0.9	6	0.7
GCE O level passes	165	22.3	253	28.0
GCE A level passes	10	1.3	11	1.2
Diploma	18	2.4	25	2.8
University and above	35	4.7	45	5.0
Unknown/Others	8	1.1	34	3.8
All Educational Levels	741	100	904	100

#### 8.6.1.2 Prevalent Patients

The prevalent dialysis patients who had no formal education were 19.3% in 2010 and 16.5% in 2011. See Table 8.6.1.2.1.

Table 8.6.1.2.1: PREVALENT DIALYSIS PATIENTS BY EDUCATIONAL LEVEL

EDUCATIONAL LEVEL	20	10	20	11
EDUCATIONAL LEVEL	No	%	No	%
No formal education	888	19.3	809	16.5
Low primary	1080	23.5	1172	23.9
PSLE Certificate	1092	23.8	1142	23.3
GCE N level passes	94	2.0	100	2.0
GCE O level passes	968	21.1	1131	23.1
GCE A level passes	112	2.4	114	2.3
Diploma	148	3.2	157	3.2
University and above	169	3.7	197	4.0
Unknown/Others	45	1.0	73	1.5
All Educational Levels	4596	100	4895	100

### 8.7 Haemodialysis

#### 8.7.1 Incidence and Prevalence

During 2010, there were 611 new HD patients (CR 170.6 pmp; ASR 135.7 pmp) who started on HD and 56 were transplanted. During 2011, there were 741 new HD patients (CR 203.4 pmp; ASR 157.2 pmp) who started on HD and 68 were transplanted.

There were 424 deaths in 2010 and 559 in 2011 among HD patients.

The prevalent HD population numbered 4020 patients (CR 1065.8 pmp; ASR 778.4 pmp) in 2010, while 4270 patients (CR 1126.9 pmp; ASR 795.2 pmp) in 2011. See Table 8.7.1.1.

Table 8.7.1.1: INCIDENT AND PREVALENT HD PATIENTS

		20	10		2011			
	New Patients	Transplanted	Dialysis Deaths for preceding one year	Prevalent Dialysis Population	New Patients	Transplanted	Dialysis Deaths for preceding one year	Prevalent Dialysis Population
Number	611	56	424	4020	741	68	559	4270
CR*	170.6	14.8	115.1	1065.8	203.4	17.9	147.5	1126.9
ASR*	135.7	_	83.8	778.4	157.2	_	102.0	795.2

<sup>\*</sup> per million residential population

#### 8.7.2 Incidence

The mean age was 60.9 years (median 60.8 years) in 2010 and also 60.9 years (median 61.5 years in 2011. The mean age for incident HD patients increased from 52.6 years old in 1999 to 60.9 years old in 2011. See Figure 8.7.2.1.

Within the incident HD population, 57.4% in 2010 and 63.6% in 2011 were male. In 2010, 53.4% of patients were age 60 years and above while in 2011 it was 54.3%. See Table 8.7.2.1.

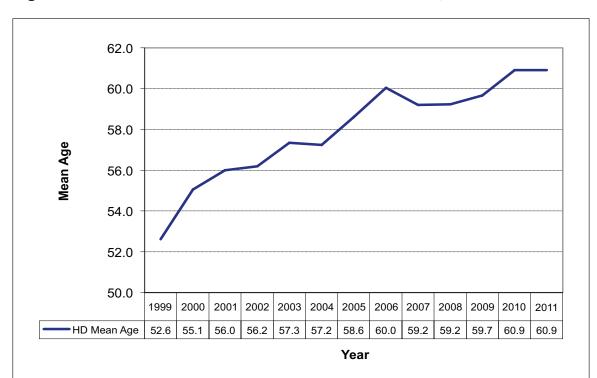


Figure 8.7.2.1: MEAN AGE OF INCIDENT HD PATIENTS, 1999 – 2011

Table 8.7.2.1: INCIDENT HD PATIENTS BY AGE GROUP AND GENDER

	2010								
AGE GROUP	Male		Fen	nale	Both Genders				
	No	%	No	%	No	%			
0–19	1	0.3	1	0.4	2	0.3			
20–29	3	0.9	5	1.9	8	1.3			
30–39	13	3.7	8	3.1	21	3.4			
40–49	36	10.3	40	15.4	76	12.4			
50–59	108	30.8	69	26.5	177	29.0			
60–69	114	32.5	72	27.7	186	30.4			
70–79	52	14.8	49	18.8	101	16.5			
80+	24	6.8	16	6.2	40	6.5			
All Age Groups	351	100	260	100	611	100			

			20	11			
AGE GROUP	Male		Fen	nale	Both Genders		
	No	%	No	%	No	%	
0–19	0	0.0	1	0.4	1	0.1	
20–29	7	1.5	2	0.7	9	1.2	
30–39	20	4.2	7	2.6	27	3.6	
40–49	68	14.4	30	11.1	98	13.2	
50–59	126	26.8	78	28.9	204	27.5	
60–69	145	30.8	73	27.0	218	29.4	
70–79	84	17.8	64	23.7	148	20.0	
80+	21	4.5	15	5.6	36	4.9	
All Age Groups	471	100	270	100	741	100	

More than half of the new HD patients were of age 50 – 69 years. See Figure 8.7.2.2.

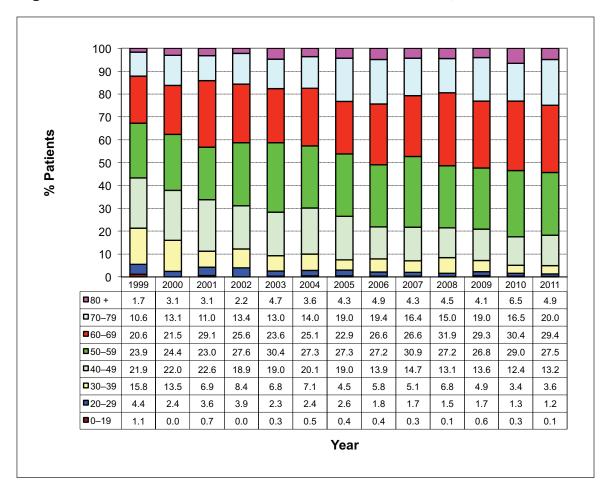


Figure 8.7.2.2: INCIDENT HD PATIENTS BY AGE GROUP, 1999 – 2011

The proportion of Malays in new HD patients was slightly higher than the ethnic distribution in the country. See Table 8.7.2.2.

Table 8.7.2.2: INCIDENT HD PATIENTS BY ETHNIC GROUP AND GENDER

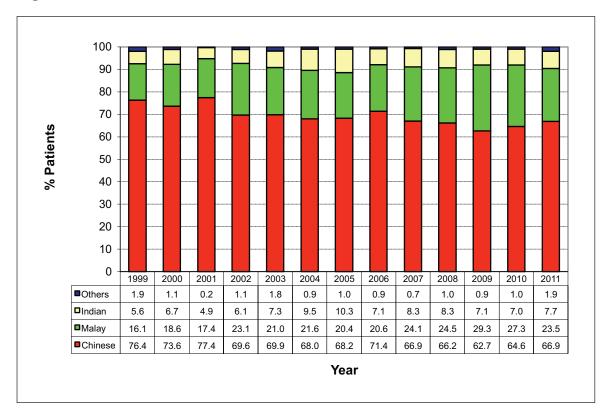
	2010								
ETHNIC GROUP	Male		Fen	nale	Both Genders				
	No	%	No	%	No	%			
Chinese	251	71.5	144	55.4	395	64.6			
Malay	75	21.4	92	35.4	167	27.3			
Indian	22	6.3	21	8.1	43	7.0			
Others	3	0.9	3	1.2	6	1.0			
All Ethnic Groups	351	100	260	100	611	100			

Table 8.7.2.2: INCIDENT HD PATIENTS BY ETHNIC GROUP AND GENDER

	2011					
ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	335	71.1	161	59.6	496	66.9
Malay	89	18.9	85	31.5	174	23.5
Indian	41	8.7	16	5.9	57	7.7
Others	6	1.3	8	3.0	14	1.9
All Ethnic Groups	471	100	270	100	741	100

As in the general population, the majority of new HD patients are Chinese. See Figure 8.7.2.3.

Figure 8.7.2.3: INCIDENT HD PATIENTS BY ETHNIC GROUP, 1999 – 2011



Male incident HD patients outnumbered females in the period 2000 – 2011. See Table 8.7.2.3.

Table 8.7.2.3: INCIDENT HD PATIENTS BY GENDER, 1999 – 2011

YEAR	Ma	ale	Fen	nale
ILAK	No	%	No	%
1999	174	48.3	186	51.7
2000	227	50.3	224	49.7
2001	260	58.2	187	41.8
2002	203	56.5	156	43.5
2003	206	53.5	179	46.5
2004	226	53.6	196	46.4
2005	261	52.8	233	47.2
2006	309	54.5	258	45.5
2007	330	54.5	275	45.5
2008	379	56.2	295	43.8
2009	357	56.0	281	44.0
2010	351	57.4	260	42.6
2011	471	63.6	270	36.4

### 8.7.3 Prevalence

In 2010, there were 4020 prevalent patients (CR 1065.8 pmp; ASR 778.4 pmp) on HD as of 31 December 2010. While in 2011, there were 4270 prevalent patients (CR 1126.9 pmp; ASR 795.2 pmp) on HD as of 31 December 2011.

The mean age of all HD patients was 60.6 years (median 60.9 years) in 2010 and 60.9 (median 61.1 years) in 2011. The mean age for prevalent HD patients has increased from a mean of 53.7 years old in 1999 to 60.9 years old in 2011. See Figure 8.7.3.1.

Males made up 54.1% in 2010 and 55.9% in 2011. 53.0% were aged 60 years or above in 2010 and 53.5% in 2011. See Table 8.7.3.1.

62.0 60.0 58.0 56.0 54.0 52.0 50.0 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 HD Mean Age 54.5 55.3 55.8 56.2 56.7 57.4 58.3 58.9 59.5 59.9 60.6 60.9 Year

Figure 8.7.3.1: AGE OF PREVALENT HD PATIENTS, 1999 – 2011

Table 8.7.3.1: PREVALENT HD PATIENTS BY AGE GROUP AND GENDER

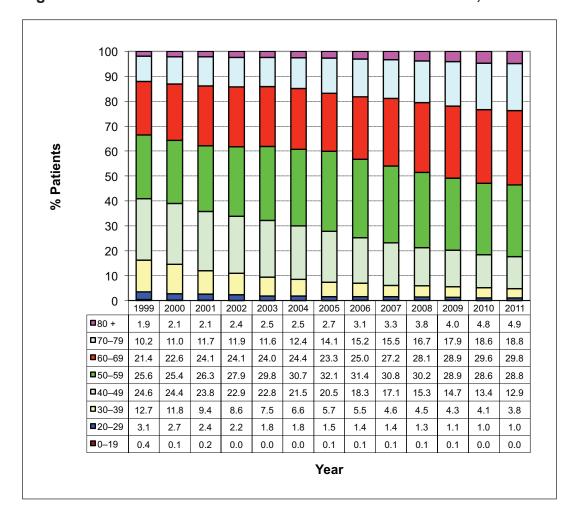
	2010									
AGE GROUP	Ma	ale	Fen	nale	Both Genders					
	No	%	No	%	No	%				
0–19	0	0.0	2	0.1	2	0.0				
20–29	23	1.1	16	0.9	39	1.0				
30–39	97	4.5	67	3.6	164	4.1				
40–49	301	13.8	236	12.8	537	13.4				
50–59	640	29.4	511	27.7	1151	28.6				
60–69	657	30.2	532	28.8	1189	29.6				
70–79	369	17.0	377	20.4	746	18.6				
80+	88	4.0	104	5.6	192	4.8				
All Age Groups	2175	100	1845	100	4020	100				

Table 8.7.3.1: PREVALENT HD PATIENTS BY AGE GROUP AND GENDER

		2011									
AGE GROUP	Male		Fen	nale	Both Genders						
	No	%	No	%	No	%					
0–19	0	0.0	1	0.1	1	0.0					
20–29	27	1.1	14	0.7	41	1.0					
30–39	99	4.1	63	3.3	162	3.8					
40–49	319	13.4	230	12.2	549	12.9					
50–59	695	29.1	535	28.4	1230	28.8					
60–69	727	30.5	547	29.0	1274	29.8					
70–79	410	17.2	393	20.9	803	18.8					
80+	109	4.6	101	5.4	210	4.9					
All Age Groups	2386	100	1884	100	4270	100					

The proportion of existing HD patients were highest in age groups 50 - 59 and 60 - 69 while the younger age groups showed a decreasing trend. See Figure 8.7.3.2.

Figure 8.7.3.2: PREVALENT HD PATIENTS BY AGE GROUP, 1999 - 2011



In 2010, the ethnic composition was as follows: Chinese 68.5%, Malay 23.7%, Indian 6.9% and 0.9% other races. See Table 8.7.3.2.

In 2011, the ethnic composition was as follows: Chinese 67.6%, Malay 24.3%, Indian 7.0% and 1.1% other races. See Table 8.7.3.2.

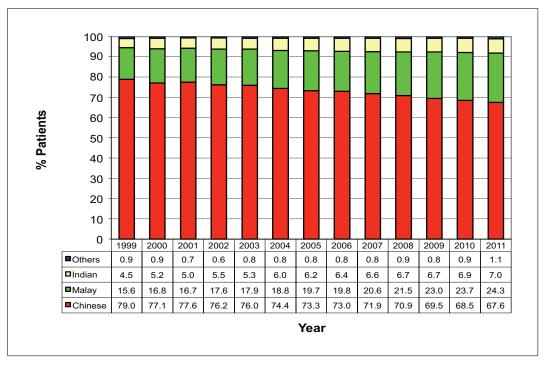
Table 8.7.3.2: PREVALENT HD PATIENTS BY ETHNIC GROUP AND GENDER

	2010								
ETHNIC GROUP	Ma	ale	Fen	nale	Both Genders				
	No	%	No	%	No	%			
Chinese	1563	71.9	1191	64.6	2754	68.5			
Malay	434	20.0	518	28.1	952	23.7			
Indian	159	7.3	120	6.5	79	6.9			
Others	19	0.9	16	0.9	35	0.9			
All Ethnic Groups	2175	100	1845	100	4020	100			

	2011									
ETHNIC GROUP	Male		Fen	nale	Both Genders					
	No	%	No	%	No	%				
Chinese	1695	71.0	1190	63.2	2885	67.6				
Malay	486	20.4	553	29.4	1039	24.3				
Indian	183	7.7	118	6.3	301	7.0				
Others	22	0.9	23	1.2	45	1.1				
All Ethnic Groups	2386	100	1884	100	4270	100				

The number of existing Chinese patients on HD declined from 79.0% in 1999 to 67.6% in 2011, while the Indians and Malays have increased. See Figure 8.7.3.3.

Figure 8.7.3.3: PREVALENT HD PATIENTS BY ETHNIC GROUP, 1999 – 2011



The proportion of existing male HD patients was consistently higher than that for females for 1999 – 2011. See Table 8.7.3.3.

Table 8.7.3.3: PREVALENT HD PATIENTS BY GENDER, 1999 – 2011

YEAR	Ma	ale	Fen	nale
ILAK	No	%	No	%
1999	1050	51.1	1005	48.9
2000	1179	50.7	1148	49.3
2001	1274	51.0	1222	49.0
2002	1315	51.7	1228	48.3
2003	1356	51.6	1272	48.4
2004	1389	51.4	1312	48.6
2005	1463	51.1	1401	48.9
2006	1589	51.9	1474	48.1
2007	1713	52.6	1542	47.4
2008	1884	52.7	1691	47.3
2009	2021	53.4	1764	46.6
2010	2175	54.1	1845	45.9
2011	2386	55.9	1884	44.1

# 8.7.4 Aetiology of Renal Failure

Diabetic nephropathy was the aetiology of renal failure in 62.2% of incident HD patients in 2010 and 59.9% in 2011. Primary glomerulonephritis was the aetiology of renal failure in 19.5% of incident HD patients in 2010 and 17.8% in 2011.

Diabetic nephropathy was the leading cause of renal failure in prevalent HD patients (45.1% in 2010; 46.1% in 2011) followed by primary glomerulonephritis (33.4% in 2010; 32.0% in 2011). See Table 8.7.4.1.

Table 8.7.4.1: INCIDENT AND PREVALENT HD PATIENTS BY AETIOLOGY OF RENAL FAILURE

		20	10		2011			
Cause of CKD5	Inci	dent	Prevalent		Inci	dent	Prev	/alent
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	380	62.2	1813	45.1	444	59.9	1967	46.1
Primary Glomerulonephritis (GN)	119	19.5	1341	33.4	132	17.8	1367	32.0
Autoimmune Disease/GN with Systemic Manifestations	6	1.0	82	2.0	6	8.0	83	1.9
Hypertension and Renovascular Disease	75	12.3	437	10.9	102	13.8	480	11.2
Polycystic Kidney Disease/Other Cystic Diseases	14	2.3	116	2.9	18	2.4	131	3.1
Vesicoureteric Reflux/Chronic Pyelonephritis	0	0.0	21	0.5	3	0.4	22	0.5
Obstruction	2	0.3	37	0.9	6	8.0	38	0.9
Stone Disease	1	0.2	12	0.3	1	0.1	11	0.3
Miscellaneous	13	2.1	92	2.3	22	3.0	102	2.4
Unknown	1	0.2	69	1.7	7	0.9	69	1.6
All Causes of CKD5	611	100	4020	100	741	100	4270	100

Figure 8.3.1.4(a) showed the 12-year trend (1999 – 2011) of diabetic nephropathy among HD patients.

### 8.7.5 Service Provider

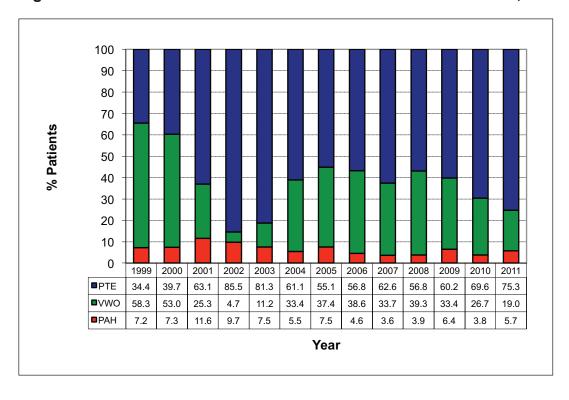
While the majority of new HD patients (69.6% in 2010; 75.3% in 2011) were dialysed in private dialysis centres, most prevalent HD patients (66.0% in 2010; 63.7% in 2011) were dialysed in centres run by voluntary welfare organisations (VWO). This probably reflects the patients' long term choice for subsidised dialysis. See Table 8.7.5.1.

Table 8.7.5.1: INCIDENT AND PREVALENT HD PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER		2	2010		2011				
	New	%	Prevalent	%	New	%	Prevalent	%	
PAH	23	3.8	92	2.3	42	5.7	102	2.4	
VWO	163	26.7	2654	66.0	141	19.0	2722	63.7	
PTE	425	69.6	1274	31.7	558	75.3	1446	33.9	
All Providers	611	100	4020	100	741	100	4270	100	

The percentage of new HD patients dialysed in private centres increased from 34.4% in 1999 to 85.5% in 2002 and fluctuated from 55.1% to 81.3% subsequently. Intake of new HD patients to voluntary welfare organisations (VWO) was lowest in 2002, subsequently it stabilised for 5 years from 2004 to 2008 before dropping from 2008 onwards. See Figure 8.7.5.1.

Figure 8.7.5.1: INCIDENT HD PATIENTS BY SERVICE PROVIDER, 1999 – 2011



In the period 1999 – 2011, more than two-thirds of the prevalent HD patients were dialysed at centres run by VWOs. See Figure 8.7.5.2. The proportion has been dropping from 2005.

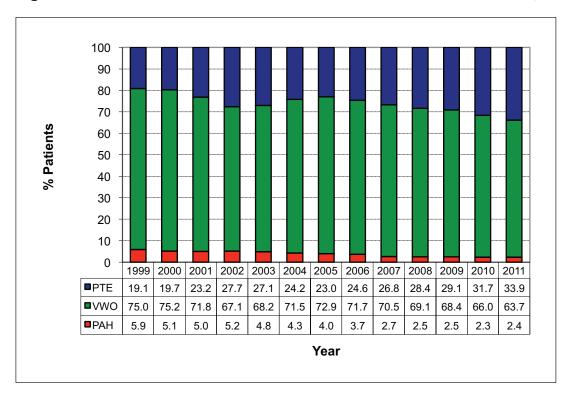


Figure 8.7.5.2: PREVALENT HD PATIENTS BY SERVICE PROVIDER, 1999 – 2011

# 8.7.6 Dialysis Treatment

The majority of prevalent HD patients (2010: 96.5%; 2011: 97.3%) were dialysed three times a week. More patients in the VWO centres (2010: 99.8%; 2011: 99.9%) and Public Acute Hospitals (2010: 94.6%; 2011: 97.1%) dialysed three times a week. See Table 8.7.6.1.

Table 8.7.6.1: PREVALENT HD PATIENTS BY FREQUENCY OF HD AND SERVICE PROVIDER, 2010

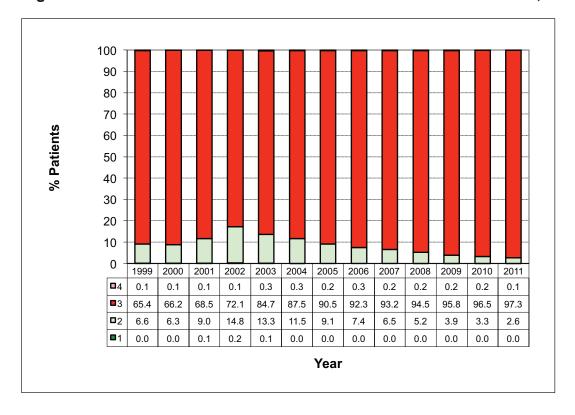
SESSION PER WEEK	2010									
	P/	λH	VV	VO	P.	PTE		LL		
	No	%	No	%	No	%	No	%		
1	0	0.0	0	0.0	1	0.1	1	0.0		
2	3	3.3	2	0.1	127	10.0	132	3.3		
3	87	94.6	2650	99.8	1143	89.7	3880	96.5		
4	2	2.2	2	0.1	3	0.2	7	0.2		
5	0	0.0	0	0.0	0	0.0	0	0.0		
6	0	0.0	0	0.0	0	0.0	0	0.0		
Unknown	0	0.0	0	0.0	0	0.0	0	0.0		
All Patients	92	100	2654	100	1274	100	4020	100		

Table 8.7.6.1: PREVALENT HD PATIENTS BY FREQUENCY OF HD AND SERVICE PROVIDER, 2011

050000	2011									
SESSION PER WEEK	P/	λH	VV	VO	PTE		ALL			
PER WEEK	No	%	No	%	No	%	No	%		
1	0	0.0	0	0.0	1	0.1	1	0.0		
2	2	2.0	2	0.1	107	7.4	111	2.6		
3	99	97.1	2719	99.9	1336	92.4	4154	97.3		
4	1	1.0	1	0.0	2	0.1	4	0.1		
5	0	0.0	0	0.0	0	0.0	0	0.0		
6	0	0.0	0	0.0	0	0.0	0	0.0		
Unknown	0	0.0	0	0.0	0	0.0	0	0.0		
All Patients	102	100	2722	100	1446	100	4270	100		

The number of patients dialysing 3 times per week is increasing. See Figure 8.7.6.1.

Figure 8.7.6.1: PREVALENT HD PATIENTS BY FREQUENCY OF HD, 1999 – 2011



Of all the patients dialysing three times a week, majority of them (2010: 78.3%; 2011: 80.8%) dialysed between 3.5 to 4.0 hours. More patients in the private centres dialysed 3.5 hours or longer. See Table 8.7.6.2.

Table 8.7.6.2: PREVALENT PATIENTS DIALYSING THREE TIMES A WEEK BY NUMBER OF HOURS PER SESSION AND SERVICE PROVIDER

NUMBER OF	2010									
HOURS	P/	λΗ	VV	VO	PTE		ALL			
PER SESSION	No	%	No	%	No	%	No	%		
<=3.0	3	3.4	4	0.2	3	0.3	10	0.3		
>3.0-3.5	13	14.9	98	3.7	10	0.9	121	3.1		
>3.5-4.0	68	78.2	1854	70.0	1116	97.6	3038	78.3		
>4.0-4.5	3	3.4	626	23.6	14	1.2	643	16.6		
>4.5	0	0.0	68	2.6	0	0.0	68	1.8		
Unknown	0	0.0	0	0.0	0	0.0	0	0.0		
All Patients	87	100	2650	100	1143	100	3880	100		

NUMBER OF	2011									
HOURS	P/	λH	VV	VO	P.	ΓΕ	ALL			
PER SESSION	No	%	No	%	No	%	No	%		
<=3.0	4	4.0	5	0.2	3	0.2	12	0.3		
>3.0-3.5	13	13.1	84	3.1	11	8.0	108	2.6		
>3.5-4.0	77	77.8	1969	72.4	1309	98.0	3355	80.8		
>4.0-4.5	5	5.1	599	22.0	13	1.0	617	14.9		
>4.5	0	0.0	62	2.3	0	0.0	62	1.5		
Unknown	0	0.0	0	0.0	0	0.0	0	0.0		
All Patients	99	100	2719	100	1336	100	4154	100		

### 8.8 Peritoneal Dialysis

### 8.8.1 Incidence and Prevalence

During 2010, there were 130 new PD patients who survived 90 days after starting on PD (CR 34.5 pmp; ASR 26.1 pmp). 9 patients were transplanted. There were 126 deaths.

During 2011, there were 163 new PD patients who survived 90 days after starting on PD (CR 43.0 pmp; ASR 31.1 pmp). 8 patients were transplanted. There were 104 deaths.

The prevalent PD population numbered 576 patients (CR 152.7 pmp; ASR 118.0 pmp) in 2010 and 625 patients (CR 164.9 pmp; ASR 124.0 pmp) in 2011. See Table 8.8.1.1. This comprised 12.5% of the prevalent dialysis population in 2010 and 12.8% in 2011. See Figure 8.3.2.1.

Table 8.8.1.1: INCIDENT AND PREVALENT PD PATIENTS

	2010					2011				
	New Patients	Transplanted	Dialysis Deaths for preceding one year	Prevalent Dialysis Population	New Patients Transplanted prece		Dialysis Deaths for preceding one year	Prevalent Dialysis Population		
Number	130	9	126	576	163	8	104	625		
CR*	34.5	2.4	33.4	152.7	43.0	2.1	27.4	164.9		
ASR*	26.1	_	24.9	118.0	31.1	_	18.8	124.0		

<sup>\*</sup> per million residential population

### 8.8.1.1 Incidence

Of the new patients in 2010, 44.6% (58/130) were male, unlike the higher proportion in HD patients. The mean age was 63.1 years (median 65.5 years), similar to the HD patients. Most patients were aged 60 years and above. See Table 8.8.1.1.1.

Of the new patients in 2011, 50.9% (83/163) were male. The mean age was 61.0 years (median 61.8 years).

Figure 8.8.1.1.1 shows the trend of the mean age of incident PD patients.

Figure 8.8.1.1.1: AGE OF INCIDENT PD PATIENTS, 1999 – 2011

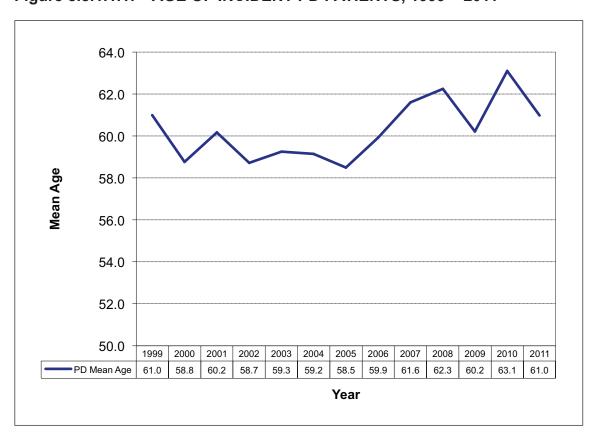


Table 8.8.1.1.1: INCIDENT PD PATIENTS BY AGE GROUP AND GENDER

		2010						
AGE GROUP	Male		Fen	nale	Both Genders			
	No	%	No	%	No	%		
0–19	0	0.0	1	1.4	1	0.8		
20–29	3	5.2	1	1.4	4	3.1		
30–39	2	3.4	2	2.8	4	3.1		
40–49	3	5.2	4	5.6	7	5.4		
50–59	18	31.0	11	15.3	29	22.3		
60–69	19	32.8	27	37.5	46	35.4		
70–79	9	15.5	21	29.2	30	23.1		
80+	4	6.9	5	6.9	9	6.9		
All Age Groups	58	100	72	100	130	100		

		2011							
AGE GROUP	Male		Fen	nale	Both Genders				
	No	%	No	No %		%			
0–19	1	1.2	2	2.5	3	1.8			
20–29	2	2.4	3	3.8	5	3.1			
30–39	7	8.4	5	6.3	12	7.4			
40–49	5	6.0	4	5.0	9	5.5			
50–59	23	27.7	16	20.0	39	23.9			
60–69	21	25.3	25	31.3	46	28.2			
70–79	18	21.7	12	15.0	30	18.4			
80+	6	7.2	13	16.3	19	11.7			
All Age Groups	83 100		80	100	163	100			

Age groups 50 - 59 and 60 - 69 had the largest number of new PD patients for 1999 - 2011. See Figure 8.8.1.1.2.

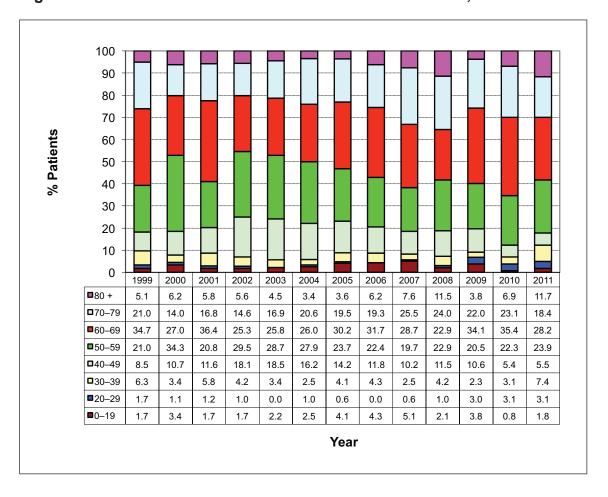


Figure 8.8.1.1.2: INCIDENT PD PATIENTS BY AGE GROUP, 1999 – 2011

In the incident PD population, the majority were Chinese (2010: 70.8%; 2011: 73.0%). The proportion of Malays was higher than the general population (2010: 21.5%; 2011: 20.9%). See Table 8.8.1.1.2.

Table 8.8.1.1.2: INCIDENT PD PATIENTS BY ETHNIC GROUP AND GENDER

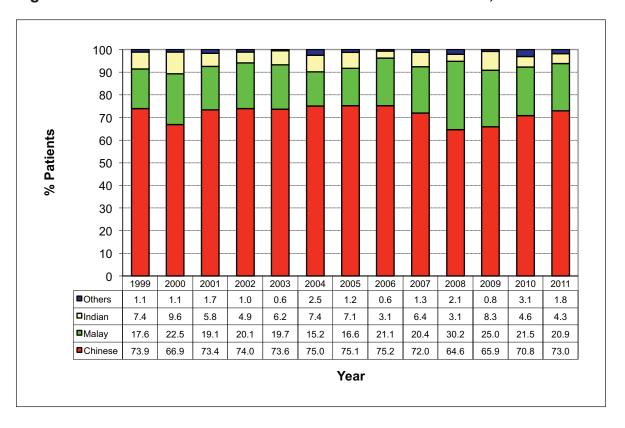
	2010							
ETHNIC GROUP	Male		Fen	nale	Both Genders			
	No	%	No	%	No	%		
Chinese	43	74.1	49	68.1	92	70.8		
Malay	10	17.2	18	25.0	28	21.5		
Indian	3	5.2	3	4.2	6	4.6		
Others	2	3.4	2	2.8	4	3.1		
All Ethnic Groups	58	100	72 100		130	100		

Table 8.8.1.1.2: INCIDENT PD PATIENTS BY ETHNIC GROUP AND GENDER

	2011							
ETHNIC GROUP	Ma	ale	Fen	nale	Both Genders			
	No	%	No	%	No	%		
Chinese	61	73.5	58	72.5	119	73.0		
Malay	18	21.7	16	20.0	34	20.9		
Indian	2	2.4	5	6.3	7	4.3		
Others	2	2.4	1	1.3	3	1.8		
All Ethnic Groups	83	100	80	100	163	100		

As in HD patients, the highest proportion in PD patients was Chinese. See Figure 8.8.1.1.3.

Figure 8.8.1.1.3: INCIDENT PD PATIENTS BY ETHNIC GROUP, 1999 – 2011



Females outnumbered males among the incident PD patients in the period 1999–2011 except for the years 2000, 2006 and 2011. See Table 8.8.1.1.3.

**Table 8.8.1.1.3: INCIDENT PD PATIENTS BY GENDER, 1999 – 2011** 

YEAR	Ma	ale	Female		
ILAN	No	%	No	%	
1999	78	44.3	98	55.7	
2000	101	56.7	77	43.3	
2001	74	42.8	99	57.2	
2002	138	47.9	150	52.1	
2003	87	48.9	91	51.1	
2004	97	47.5	107	52.5	
2005	78	46.2	91	53.8	
2006	82	50.9	79	49.1	
2007	78	49.7	79	50.3	
2008	38	39.6	58	60.4	
2009	64	48.5	68	51.5	
2010	58	44.6	72	55.4	
2011	83	50.9	80	49.1	

### 8.8.1.2 Prevalence

There were 576 prevalent patients (CR 152.7 pmp; ASR 118.0 pmp) on PD as of 31 December 2010. Of these, 42.4% (244 patients) were males. The mean age was 58.8 years (median 61.2 years).

There were 625 prevalent patients (CR 164.9 pmp; ASR 124.0 pmp) on PD as of 31 December 2011. Of these, 45.4% (284 patients) were males. The mean age was 59.5 years (median 62.1 years).

The mean age for prevalent PD patients ranged from 57.4 years old to 59.5 years old in the period 1999 - 2011. See Figure 8.8.1.2.1.

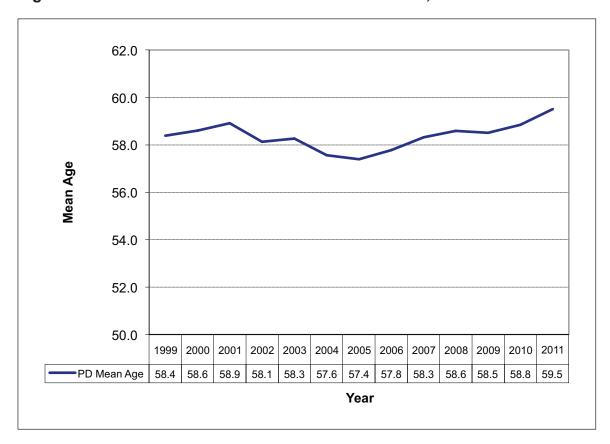


Figure 8.8.1.2.1: AGE OF PREVALENT PD PATIENTS, 1999 – 2011

About half of the prevalent PD patients were aged 60 years or above. These patients were older than the prevalent HD patients. See Table 8.8.1.2.2.

Table 8.8.1.2.2: PREVALENT PD PATIENTS BY AGE GROUP AND GENDER

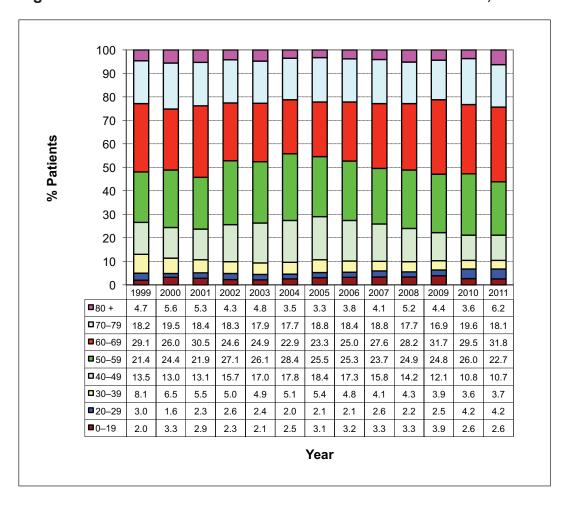
	2010							
AGE GROUP	Male		Fen	nale	Both Genders			
	No	%	No	%	No	%		
0–19	6	2.5	9	2.7	15	2.6		
20–29	15	6.1	9	2.7	24	4.2		
30–39	6	2.5	15	4.5	21	3.6		
40–49	16	6.6	46	13.9	62	10.8		
50–59	71	29.1	79	23.8	150	26.0		
60–69	80	32.8	90	27.1	170	29.5		
70–79	43	17.6	70	21.1	113	19.6		
80+	7	2.9	14	4.2	21	3.6		
All Age Groups	244	100	332	100	576	100		

Table 8.8.1.2.2: PREVALENT PD PATIENTS BY AGE GROUP AND GENDER

		2011							
AGE GROUP	Ma	ale	Fen	nale	Both Genders				
	No	%	No	%	No	%			
0–19	7	2.5	9	2.6	16	2.6			
20–29	16	5.6	10	2.9	26	4.2			
30–39	8	2.8	15	4.4	23	3.7			
40–49	24	8.5	43	12.6	67	10.7			
50–59	68	23.9	74	21.7	142	22.7			
60–69	102	35.9	97	28.4	199	31.8			
70–79	47	16.5	66	19.4	113	18.1			
80+	12	4.2	27	7.9	39	6.2			
All Age Groups	284	100	341	100	625	100			

As with incident peritoneal patients, age groups 60 - 69 years have the highest proportion of existing PD patients. See Figure 8.8.1.2.2.

Figure 8.8.1.2.2: PREVALENT PD PATIENTS BY AGE GROUP, 1999 - 2011



The majority of the patients were Chinese (70.5%). Malays comprised 21.5%; Indian 5.7%, and other races 2.3% in 2010. See Table 8.8.1.2.3.

The majority of the patients were Chinese (73.4%). Malays comprised 19.5%; Indian 5.0%, and other races 2.1% in 2011. See Table 8.8.1.2.3.

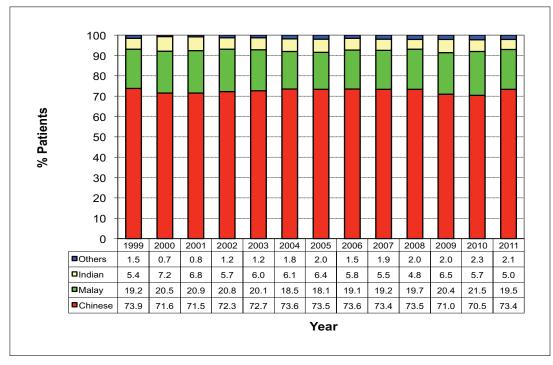
Table 8.8.1.2.3: PREVALENT PD PATIENTS BY ETHNIC GROUP AND GENDER

		2010						
ETHNIC GROUP	Male		Fen	nale	Both Genders			
	No	%	No	%	No	%		
Chinese	173	70.9	233	70.2	406	70.5		
Malay	51	20.9	73	22.0	124	21.5		
Indian	16	6.6	17	5.1	33	5.7		
Others	4	1.6	9	2.7	13	2.3		
All Ethnic Groups	244 100		332	100	576	100		

		2011						
ETHNIC GROUP	Ma	Male		nale	Both Genders			
	No	%	No	%	No	%		
Chinese	207	72.9	252	73.9	459	73.4		
Malay	58	20.4	64	18.8	122	19.53		
Indian	14	4.9	17	5.0	31	5.0		
Others	5	1.8	8	2.3	13	2.1		
All Ethnic Groups	284 100		341	100	625	100		

For the period 1999 - 2011, more than 70% of existing peritoneal patients were Chinese. See Figure 8.8.1.2.3.

Figure 8.8.1.2.3: PREVALENT PD PATIENTS BY ETHNIC GROUP, 1999 – 2011



The proportion of existing female PD patients was consistently higher than the male patients for 1999 – 2011. See Table 8.8.1.2.4.

Table 8.8.1.2.4: PREVALENT PD PATIENTS BY GENDER, 1999 – 2011

YEAR	Ma	ale	Female			
IEAN	No	%	No	%		
1999	167	41.1	239	58.9		
2000	201	46.7	229	53.3		
2001	219	44.9	269	55.1		
2002	296	45.3	358	54.7		
2003	310	46.2	361	53.8		
2004	325	46.0	382	54.0		
2005	318	45.4	383	54.6		
2006	326	45.9	385	54.1		
2007	314	45.6	374	54.4		
2008	264	44.1	335	55.9		
2009	261	43.7	336	56.3		
2010	244	42.4	332	57.6		
2011	284	45.4	341	54.6		

# 8.8.2 Aetiology of Renal Failure

In 2010, the majority of new patients going onto PD were patients with diabetic nephropathy (68.5%). Diabetic nephropathy in the prevalent population, however, accounted for 46.5%. This probably reflects the lower survival rate of patients with diabetic nephropathy. Patients with primary glomerulonephritis comprised only 16.9% of the new patients but formed 26.7% of the prevalent PD patients. See Table 8.8.2.1.

In 2011, the majority of new patients going onto PD were patients with diabetic nephropathy (65.6%). Diabetic nephropathy in the prevalent population, however, accounted for 50.6%. Patients with primary glomerulonephritis comprised only 16.6% of the new patients but formed 25.1% of the prevalent PD patients.

Table 8.8.2.1: INCIDENT AND PREVALENT PD PATIENTS BY AETIOLOGY
OF RENAL FAILURE

		20	10		2011			
Cause of CKD5	Incident		Prevalent		Incident		Prevalent	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	89	68.5	268	46.5	107	65.6	316	50.6
Primary Glomerulonephritis (GN)	22	16.9	154	26.7	27	16.6	157	25.1
Autoimmune Disease/GN with Systemic Manifestations	0	0.0	30	5.2	3	1.8	31	5.0
Hypertension and Renovascular Disease	13	10.0	70	12.2	15	9.2	68	10.9
Polycystic Kidney Disease/Other Cystic Diseases	1	0.8	15	2.6	2	1.2	13	2.1
Vesicoureteric Reflux/Chronic Pyelonephritis	0	0.0	4	0.7	0	0.0	5	0.8
Obstruction	0	0.0	2	0.3	2	1.2	3	0.5
Stone Disease	0	0.0	1	0.2	1	0.6	2	0.3
Miscellaneous	4	3.1	23	4.0	6	3.7	22	3.5
Unknown	1	0.8	9	1.6	0	0.0	8	1.3
All Causes of CKD5	130	100	576	100	163	100	625	100

Figure 8.3.1.4(b) showed the 12-year trend (1999 – 2011) of diabetic nephropathy among PD patients.

## 8.8.3 Service Provider

The majority of new PD patients dialysed with the Public Acute Hospitals (2010: 96.9%; 2011: 98.8%) while the remaining were with voluntary welfare organisations (2010: 0.8%; 2011: 0.0%). The distribution of prevalent patients was similar with Public Acute Hospitals caring for the majority (2010: 86.6%; 2011: 90.2%). See Table 8.8.3.1.

Table 8.8.3.1: INCIDENT AND PREVALENT PD PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER		2010				2011			
SERVICE PROVIDER	New	%	Prevalent	%	New	%	Prevalent	%	
PAH	126	96.9	499	86.6	161	98.8	564	90.2	
VWO	1	0.8	70	12.2	0	0.0	55	8.8	
PTE	3	2.3	7	1.2	2	1.2	6	1.0	
All Providers	130	100	576	100	163	100	625	100	

Twelve year trends from 1999 to 2011 for incident and prevalent patients on PD by service provider are shown below. See Figures 8.8.3.1 and 8.8.3.2.

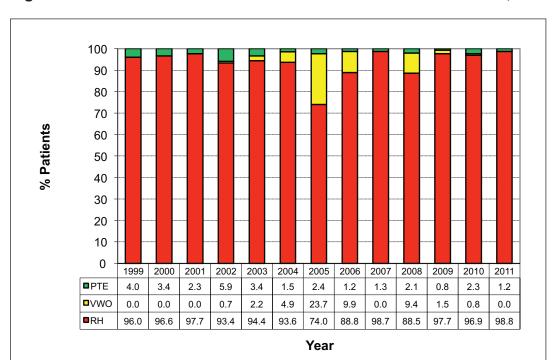
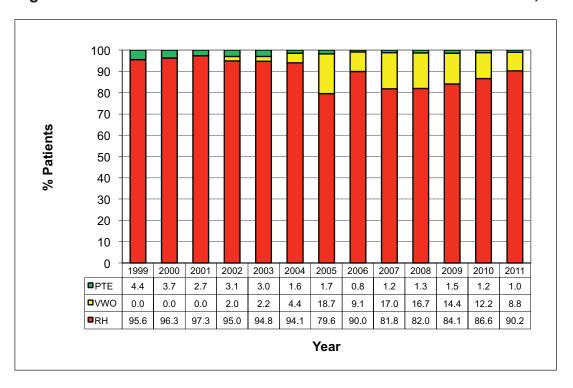


Figure 8.8.3.1: INCIDENT PD PATIENTS BY SERVICE PROVIDER, 1999 – 2011

Figure 8.8.3.2: PREVALENT PD PATIENTS BY SERVICE PROVIDER, 1999 – 2011



In all years except 2008 to 2011, majority of the incident PD patients were on Continuous Ambulatory Peritoneal Dialysis (CAPD). However there were an increasing proportion of incident and prevalent patients on Automated Peritoneal Dialysis (APD) over the years. See Figures 8.8.3.3 and 8.8.3.4.

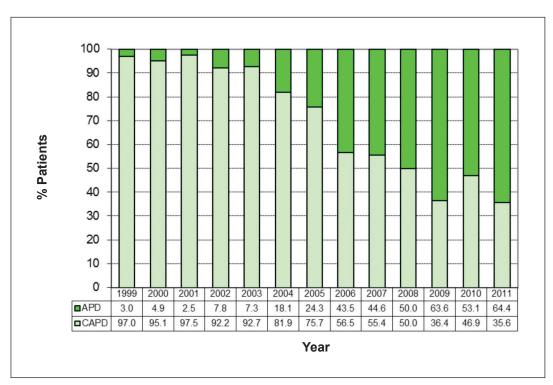
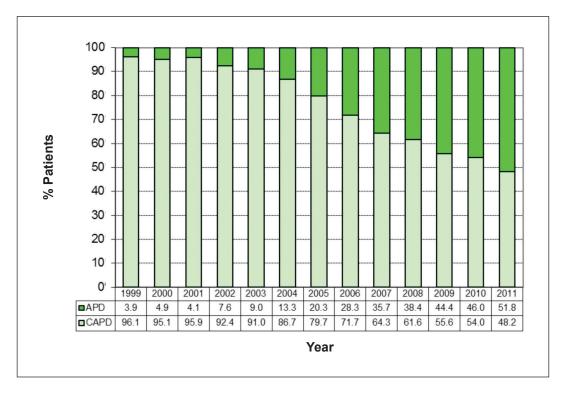


Figure 8.8.3.3: INCIDENT CAPD VS APD PATIENTS, 1999 – 2011





## 8.9 Mortality

# 8.9.1 Demographics

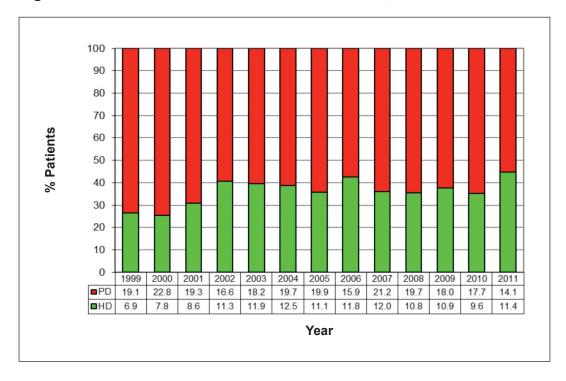
There were 560 deaths amongst dialysis patients in 2010 and 663 deaths in 2011. The death rate, reported as a proportion of all treated patients within the year, was 10.7% in 2010 and 11.8% in 2011. See Table 8.9.1.1.

Table 8.9.1.1: DEMOGRAPHICS

MODALITY	20	10	2011		
WIODALITY	No	%	No	%	
HD	434	9.6	559	11.4	
PD	126	17.7	104	14.1	
HD+PD	560	10.7	663	11.8	

The death rate was higher in PD patients (2010: 17.7%; 2011: 14.1%) compared with HD patients (2010: 9.6%; 2011: 11.4%). The death rate was consistently higher in PD patients than HD patients for the period 1999 to 2011 but the gap narrowed from 2002. See Figure 8.9.1.1.

Figure 8.9.1.1: DIALYSIS DEATH BY MODALITY, 1999 – 2011



Many factors contribute to the higher death rate in PD patients. These include their older age and more co-morbid conditions including diabetes mellitus and ischaemic heart disease.

The proportion of deaths above aged 60 was 74.3% in 2010 and 75.9% in 2011. Majority of the deaths amongst dialysis patients occurred in the age group 60 to 69 years old for both genders. See Table 8.9.1.2.

Table 8.9.1.2: DIALYSIS DEATHS BY AGE GROUP AND GENDER

	2010							
AGE GROUP	Ma	ale	Fen	nale	Both Genders			
	No	%	No	No %		%		
0–19	0	0.0	1	0.4	1	0.2		
20–29	2	0.7	1	0.4	3	0.5		
30–39	2	0.7	1	0.4	3	0.5		
40–49	13	4.4	12	4.6	25	4.5		
50–59	69	23.2	43	16.4	112	20.0		
60–69	108	36.2	84	32.1	192	34.3		
70–79	72	24.2	81	30.9	153	27.3		
80+	32	10.7	39	14.9	71	12.7		
All Age Groups	298	100	262	100	560	100		

	2011								
AGE GROUP	Ma	ale	Fen	nale	Both Genders				
	No	%	No	%	No	%			
0–19	0	0.0	0	0.0	0	0.0			
20–29	1	0.3	1	0.3	2	0.3			
30–39	5	1.4	5	1.6	10	1.5			
40–49	15	4.2	17	5.5	32	4.8			
50–59	73	20.7	43	13.9	116	17.5			
60–69	113	32.0	83	26.8	196	29.6			
70–79	102	28.9	107	34.5	209	31.5			
80+	44	12.5	54	17.4	98	14.8			
All Age Groups	353	100	310	100	663	100			

The deaths in the different ethnic groups are shown in Table 8.9.1.3.

Table 8.9.1.3: DIALYSIS DEATHS BY ETHNIC GROUP AND GENDER

	2010							
ETHNIC GROUP	Male		Fen	nale	Both Genders			
	No	%	No %		No	%		
Chinese	210	70.5	185	70.6	395	70.5		
Malay	63	21.1	60	22.9	23	22.0		
Indian	22	7.4	16	6.1	38	6.8		
Others	3	1.0	1	0.4	4	0.7		
All Ethnic Groups	298	100	262	100	560	100		

	2011							
ETHNIC GROUP	Male		Fen	nale	Both Genders			
	No	%	No	%	No	%		
Chinese	260	73.7	208	67.1	468	70.6		
Malay	64	18.1	78	25.2	142	21.4		
Indian	23	6.5	21	6.8	44	6.6		
Others	6	1.7	3	1.0	9	1.4		
All Ethnic Groups	353	100	310	100	663	100		

While majority of the deaths amongst dialysis patients occurred in the age group 60 to 69 years old for HD patients and for PD patients in 2010, most of the deaths occurred in the age group 70 to 79 years old in 2011. See Table 8.9.1.4.

Table 8.9.1.4: DIALYSIS DEATHS BY AGE GROUP AND MODALITY, 2010

	2010								
AGE GROUP	Н	D	Р	D	HD+PD				
	No	% No %		%	No	%			
0–19	0	0.0	1	0.8	1	0.2			
20–29	3	0.7	0	0.0	3	0.5			
30–39	3	0.7	0	0.0	3	0.5			
40–49	19	4.4	6	4.8	25	4.5			
50–59	90	20.7	22	17.5	112	20.0			
60–69	144	33.2	48	38.1	192	34.3			
70–79	119	27.4	34	27.0	153	27.3			
80+	56	12.9	15	11.9	71	12.77			
All Age Groups	434	100	126	100	560	100			

Table 8.9.1.4: DIALYSIS DEATHS BY AGE GROUP AND MODALITY, 2011

	2011							
AGE GROUP	HD		Р	D	HD+PD			
	No	%	No	%	No	%		
0–19	0	0.0	0	0.0	0	0.0		
20–29	2	0.4	0	0.0	2	0.3		
30–39	7	1.3	3	2.9	10	1.5		
40–49	28	5.0	4	3.8	32	4.8		
50–59	92	16.5	24	23.1	116	17.5		
60–69	168	30.1	28	26.9	196	29.6		
70–79	176	31.5	33	31.7	209	31.5		
80+	86	15.4	12	11.5	98	14.8		
All Age Groups	559	100	104	100	663	100		

The mean age of death was also similar in both modalities (HD: 67.2 years in 2010 and 68.1 years in 2011; PD: 67.4 years in 2010 and 66.7 years in 2011). Chinese appeared to have a later age at death compared with the Malays or Indians. See Table 8.9.1.5.

Table 8.9.1.5: AGE OF DIALYSIS DEATH BY ETHNIC GROUP

MODALITY 2010						2011					
WIODALI	''	Chinese	Malay	Indian	Others	All	Chinese	Malay	Indian	Others	All
	Mean	68.7	63.6	64.4	68.9	67.2	69.8	63.4	62.8	73.9	68.1
HD	Median	67.9	64.2	61.6	58.8	66.6	70.6	64.5	60.8	74.2	69.1
	Std. Dev*	11.2	12.0	10.7	20.2	11.6	11.2	12.2	9.7	11.4	11.7
	Mean	67.6	67.1	63.0	84.1	67.4	69.8	60.6	59.9	83.8	66.7
PD	Median	68.5	68.3	61.2	84.1	68.1	72.5	60.9	57.9	83.1	68.2
	Std. Dev	12.0	8.8	9.2	0.0	11.3	10.5	10.3	11.4	5.0	11.7
	Mean	68.4	64.3	64.1	72.7	67.2	69.8	62.8	62.1	77.2	67.9
HD+PD	Median	68.1	65.6	61.4	71.5	67.1	70.8	63.7	60.5	79.2	69.0
	Std. Dev	11.4	11.5	10.4	18.2	11.5	11.1	11.9	10.1	10.6	11.7

<sup>\*</sup> Std. Dev stands for Standard Deviation

### 8.9.2 Cause of Death

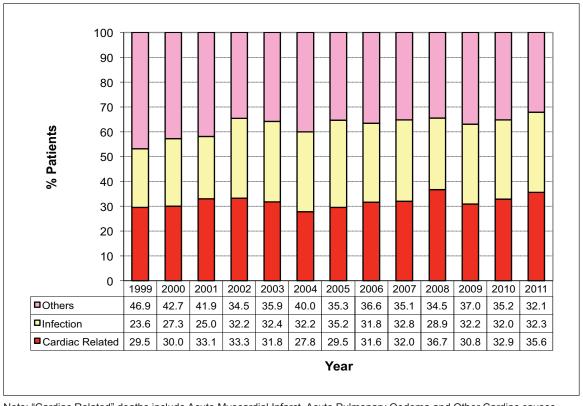
Cardiac events (AMI, APO and other cardiac causes) accounted for 32.9% of deaths in 2010 and 35.7% in 2011. Infections accounted for 32.0% in 2010 and 32.3% in 2011. See Table 8.9.2.1.

Table 8.9.2.1: CAUSES OF DEATH IN DIALYSIS PATIENTS

Cause of Death	20	10	2011		
Cause of Death	No	%	No	%	
Acute Myocardial Infarct (AMI)	77	13.8	112	16.9	
Acute Pulmonary Oedema (APO)	0	0.0	1	0.2	
Other Cardiac	107	19.1	123	18.6	
Cerebrovascular Accident (CVA)	20	3.6	27	4.1	
Infections	179	32.0	214	32.3	
Liver Failure	1	0.2	0	0.0	
Other Haemorrhage	10	1.8	7	1.1	
Malignancy	32	5.7	31	4.7	
Withdraw dialysis	0	0.0	0	0.0	
Uremia	97	17.3	124	18.	
Accidental/Homicide	2	0.4	0	0.0	
Other Social	0	0.0	0	0.0	
Died at Home	21	3.8	5	0.8	
Hyperkalemia (cardiac standstill)	0	0.0	0	0.0	
Bleeding from the Gastro-intestinal Tract (BGIT)	5	0.9	3	0.5	
Other	9	1.6	13	2.0	
Unknown	0	0.0	3	0.5	
Total	560	100	663	100	

Cardiac events and infection accounted for high proportion of deaths. See Figure 8.9.2.1.

Figure 8.9.2.1: DIALYSIS DEATH BY INFECTION AND CARDIAC RELATED CAUSES, 1999 – 2011



Note: "Cardiac Related" deaths include Acute Myocardial Infarct, Acute Pulmonary Oedema and Other Cardiac causes.

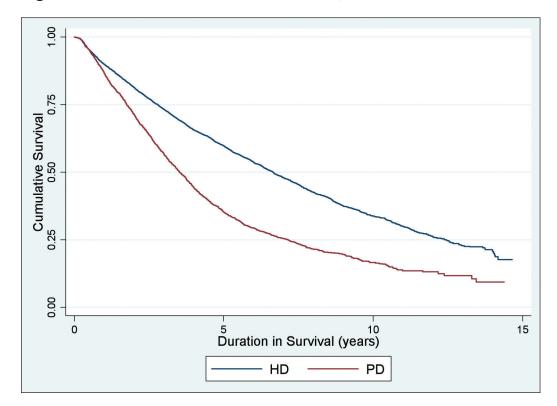
# 8.9.3 Survival Analysis for Dialysis Patients

The 1- and 5-year survival for patients who survived 90 days after initiation on dialysis was 89.1% and 53.4% respectively. There is a significant difference in survival between the patients on HD and PD (p<0.001). The 1-year survival for patients who survived 90 days after initiation on HD in the period 1999 – 2011 was 89.9% and that for PD was 86.8%. See Table 8.9.3.1. The median survival was 6.7 years for HD patients and 3.5 years for PD patients.

Table 8.9.3.1: SURVIVAL BY MODALITY, 1999 – 2011

SURVIVAL BY YEAR	1999 – 2011				
SURVIVAL DI TEAR	HD	PD			
1 year in %	89.9	86.8			
(95% C.I.)	(89.2 – 90.6)	(85.3 – 88.2)			
5 year in %	59.8	35.3			
(95% C.I.)	(58.5 – 61.1)	(33.1 – 37.5)			

Figure 8.9.3.1: SURVIVAL BY MODALITY, 1999 – 2011



There was no significant difference in the 1- and 5-year survival between female and male patients on PD (p=0.83); and also between female and male patients on HD (p=0.49). See Table 8.9.3.2.

Table 8.9.3.2: SURVIVAL BY GENDER AND MODALITY, 1999 – 2011

1999 – 2011	Ma	ale	Female			
1999 – 2011	PD	HD	PD	HD		
1 year survival in % (95% C.I.)	86.5	90.0	87.1	89.9		
	(84.3 – 88.4)	(89.0 – 90.9)	(85.0 – 88.9)	(88.7 – 90.9)		
5 year survival in % (95% C.I.)	35.1	59.5	35.5	60.1		
	(31.9 – 38.2)	(57.7 – 61.2)	(32.5 – 38.5)	(58.2 – 62.0)		

As expected, patients aged below 60 years have better survival than patients aged 60 and above for both PD and HD (p<0.001). See Table 8.9.3.3.

Table 8.9.3.3: SURVIVAL BY AGE GROUP AND MODALITY, 1999 – 2011

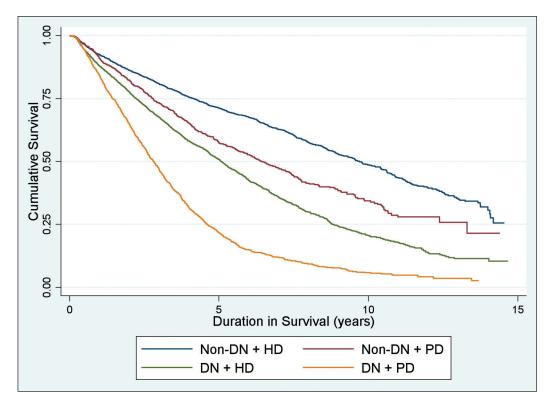
1999 – 2011	Age	< 60	Age	≥ 60
1999 – 2011	PD	HD	PD	HD
1 year survival in % (95% C.I.)	90.5	93.0	83.8	86.6
	(88.5 – 92.1)	(92.1 – 93.8)	(81.5 – 85.7)	(85.3 – 87.7)
5 year survival in % (95% C.I.)	51.5	71.1	21.6	47.4
	(48.0 – 54.7)	(69.4 – 72.7)	(19.1 – 24.3)	(45.4 – 49.3)

Similarly, non-diabetic patients have better survival as compared to diabetics (p<0.001). There was bigger gap in survival probabilities between HD and PD among the diabetics as compared to non-diabetics. See Table 8.9.3.4 and Figure 8.9.3.2.

Table 8.9.3.4: SURVIVAL BY DIABETES STATUS (PRIMARY CAUSE) AND MODALITY, 1999 – 2011

1999–2011	D	N	Nor	n-DN	DN	Non-DN
1999-2011	PD	HD	PD	HD	HD+PD	HD+PD
1 year survival in %	84.2	88.0	91.1	92.4	87.0	92.1
(95% C.I.)	(82.1 – 86.0)	(86.9 - 89.0)	(88.9 - 92.9)	(91.4 - 93.4)	(86.0 - 87.9)	(91.2 - 93.0)
5 year survival in %	21.8	50.8	57.4	71.2	42.7	68.0
(95% C.I.)	(19.4 – 24.2)	(49.0 - 52.6)	(53.6 - 60.9)	(69.4 - 73.0)	(41.2 – 44.2)	(66.3 - 69.6)

Figure 8.9.3.2: SURVIVAL BY DIABETES STATUS (PRIMARY CAUSE) AND MODALITY, 1999 – 2011



# 8.10 Management of Anaemia among Dialysis Patients

# 8.10.1 Data Response Rates for Prevalent HD and PD Patients

The response rate for haemoglobin (Hb) values was excellent 99.9% for HD patients and 99.0% for PD patients in 2010 while for 2011 it was 99.9% for HD and 99.5% for PD patients. See Tables 8.10.1.1 and 8.10.1.2.

Table 8.10.1.1: DATA RESPONSE RATE FOR PREVALENT HD PATIENTS, 2005 – 2011

Year	Н	b	Hb +	TSAT	Hb+TSAT	+Ferritin	Hb+TSAT+	- EPO use	All HD F	Patients
Icai	No	%	No	%	No	%	No	%	No	%
2011	4267	99.9	4122	96.5	4091	95.8	4121	96.5	4270	100
2010	4014	99.9	3873	96.3	3839	95.5	3871	96.3	4020	100
2009	3777	99.8	3612	95.4	3580	94.6	3609	95.4	3785	100
2008	3572	99.9	3369	94.2	3328	93.1	3369	94.2	3575	100
2007	3245	99.7	2988	91.8	2936	90.2	2988	91.8	3255	100
2006	3055	99.7	2748	89.7	2693	87.9	2748	89.7	3063	100
2005	2843	99.3	2473	86.3	2414	84.3	2471	86.3	2864	100

TSAT: Transferrin Saturation

EPO: Epoetin

Table 8.10.1.2: DATA RESPONSE RATE FOR PREVALENT PD PATIENTS, 2005 – 2011

Year	Н	b	Hb+	TSAT	Hb+TSAT	+Ferritin	Hb+TSAT+	- EPO use	All HD F	Patients
Icai	No	%	No	%	No	%	No	%	No	%
2011	622	99.5	605	96.8	571	91.4	605	96.8	625	100
2010	570	99.0	561	97.4	555	6.4	560	97.2	576	100
2009	589	98.7	574	96.1	562	94.1	573	96.0	597	100
2008	593	99.0	575	96.0	554	92.5	575	96.0	599	100
2007	679	98.7	630	91.6	600	87.2	630	91.6	688	100
2006	704	99.0	679	95.5	662	93.1	679	95.5	711	100
2005	691	98.6	642	91.6	614	87.6	639	91.2	701	100

## 8.10.2 Type of ESA for Prevalent Dialysis Patients

Use of Erythropoiesis Stimulating Agents (ESA) from 2005 was captured. In 2010, some HD patients were started on newer agents Darbepoetin (9.6%) or Micera (0.8%). A similar proportion (3.6%) of the PD patients was given Darbepoetin. A small number (0.6%) of the patients on PD was given Continuous Erythropoietin Receptor Activator (CERA, Micera®). See Tables 8.10.2.1 and 8.10.2.2.

In 2011, some HD patients were started on newer agents Darbepoetin (8.3%) or Micera (0.7%). A small proportion (1.1%) of the PD patients was given Darbepoetin. A small number (1.3%) of the patients on PD was given Continuous Erythropoietin Receptor Activator (CERA, Micera®).

Table 8.10.2.1: ESA Use, 2005 – 2011

	PD	%	100	100	100	100	100	100	100
	All PD	No	625	9/9	265	299	688	711	701
	sing	%	9.0	1.0	1.3	0.7	0.3	0.1	1.4
<b>P</b>	Missing	ON	4	9	80	4	2	1	10
Δ.	No ESA	%	10.7	10.9	11.7	11.0	12.2	12.0	11.4
	No	No	29	63	20	99	84	85	80
	On ESA	%	9.88	0.88	86.9	88.3	87.5	6'28	87.2
	uO	oN	554	209	519	529	602	625	611
	AII HD	%	100	100	100	100	100	100	100
	All	No	4270	4020	3785	3575	3255	3063	2864
	sing	%	0.0	0.1	0.2	0.0	0.0	0.1	0.2
۵	Missin	٥N	1	9	9	0	0	2	2
呈	No ESA	%	9.0	11.1	10.9	8.8	9.4	10.4	8.0
	No	No	386	445	412	315	306	319	230
	On ESA	%	6.06	88.8	89.0	91.2	90.6	89.5	91.8
	On	No	3883	3570	3367	3260	2949	2742	2629
	Year		2011	2010	2009	2008	2007	2006	2005

TYPE OF ESA FOR PREVALENT DIALYSIS PATIENTS, 2005 - 2011 Table 8.10.2.2:

				<b>운</b>	0							PD	_							₹	_			
Year	EPO/	ESA	EPO/ESA Darpoetin		Micera*	ra*	A	=	EPO/ESA	ESA	Darpoetin	oetin	Micera*	ra*	₹		EPO/ESA	ESA	Darpoetin	oetin	Micera*	era*	A	_
	9	%	8	%	9	%	9 N	%	9 N	%	9 N	%	9 N	%	2	%	9 N	%	9	%	9	%	9 N	%
2011	3531 90.9		324	8.3	78	0.7	3883	100	541	97.7	9	7.	7	1.3	554	100	4072	91.8	330	7.4	35	0.8	4437	100
2010	3201	2.68	342	9.6	27	0.8	3570	100	486	95.9	18	3.6	က	9.0	202	100	3687	90.4	360	8.8	30	0.7	4077	100
2009	3318 98.5	98.5	44	1.3	2	0.1 3367	3367	100	509	98.1	10	6.1	0	0.0	519	100	3827	98.5	54	4.1	5	0.1	3886	100
2008	3260 100.0	100.0	0	0.0	0	0.0 3260	3260	100	529	100.0	0	0.0	0	0.0	529	100	3789	100.0	0	0.0	0	0.0	3789	100
2007	2949 100.0	100.0	0	0.0	0	0.0	2949	100	602	100.0	0	0.0	0	0.0	602	100	3551	100.0	0	0.0	0	0.0	3551	100
2006	2742 100.0	100.0	0	0.0	0	0.0 2742		100	625	100.0	0	0.0	0	0.0	625	100	3367	100.0	0	0.0	0	0.0	3367	100
2005	2628	2628 100.0	0	0.0	0	0 0.0 2628	_	100	611	100.0	0	0.0	0	0.0	611	100	3239	100.0	0	0.0	0	0.0	3239	100

<sup>\*</sup> denotes alternate naming as EBMPG

### 8.10.3 Service Provider and use of ESA for Prevalent Dialysis Patients

Among haemodialysis (HD) patients, the use of ESA was 87.0% (2010) and 93.1% (2011) among the patients in Public Acute Hospitals (PAHs), 86.7% (2010) and 88.7% (2011) among the patients in Voluntary Welfare Organisations (VWOs), and 93.7% (2010) and 95.1% (2011) among the patients in Private Dialysis Centres (PTE). Generally, the use of ESA among HD patients remained relatively stable over the years.

Among peritoneal dialysis (PD) patients, the use of ESA was 89.0% (2010) and 88.6% (2011) among the patients in PAHs, and 91.4% (2010) and 94.5% (2011) among the patients in VWOs. Generally, the use of ESA among PD patients remained relatively stable over the years.

Table 8.10.3.1a: SERVICE PROVIDER AND USE OF ESA FOR PREVALENT HD PATIENTS, 2005 - 2011

		All	%	100	100	100	100	100	100	100
		A	No.	1446	1269	1098	1015	872	752	657
	Щ	No ESA	%	4.9	6.3	5.0	6.3	9.2	9.3	6.2
	PTE	ON	No.	71	80	55	64	80	42	41
		On ESA	%	95.1	93.7	95.0	2.86	8.06	94.4	93.8
		On I	No.	1375	1189	1043	951	792	710	616
		=	%	100	100	100	100	100	100	100
		All	No.	2721	2654	2588	2470	2295	2195	2087
٥	0/	SA	%	11.3	13.3	13.4	9.7	9.8	11.8	8.4
HD	VWO	No ESA	No.	308	353	348	240	224	260	175
		≡SA	%	88.7	86.7	9.98	90.3	90.2	88.2	91.6
		On ESA	No.	2413	2301	2240	2230	2071	1935	1912
		-	%	100	100	100	100	100	100	100
		AII	No.	102	92	93	06	88	114	114
	H	SA	%	6.9	13.0	9.7	12.2	2.3	14.9	12.3
	PAH	No ESA	No.	7	12	6	11	2	17	41
		On ESA	%	93.1	87.0	90.3	87.8	7.76	85.1	87.7
		On	No.	92	80	84	62	98	26	100
		real		2011	2010	2009	2008	2007	2006	2005

Table 8.10.3.1b: SERVICE PROVIDER AND USE OF ESA FOR PREVALENT PD PATIENTS, 2005 - 2011

									PD	٥								
200			P,	PAH					\$	0MV					Г	PTE		
rear	On	On ESA	No	No ESA	A	_	On ESA	SA	No ESA	ESA	Ψ	_	On	On ESA	No	No ESA	A	=
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2011	499	88.6	64	1.4	263	100	52	94.5	3	5.5	99	100	3	100.0	0	0.0	3	100
2010	443	89.0	99	11.0	498	100	64	91.4	9	8.6	02	100	0	0.0	2	100.0	2	100
2009	442	88.2	69	11.8	501	100	75	87.2	7	12.8	98	100	2	100.0	0	0.0	2	100
2008	440	83.8	20	10.2	490	100	87	87.0	13	13.0	100	100	2	40.0	3	0.09	2	100
2007	492	87.5	02	12.5	293	100	108	92.3	6	7.7	117	100	2	28.6	2	71.4	7	100
2006	564	88.1	92	11.9	640	100	29	8.06	9	9.5	92	100	2	40.0	3	0.09	2	100
2002	498	90.4	53	9.6	551	100	107	81.7	24	18.3	131	100	9	2.99	3	33.3	6	100

Table 8.10.3.1c: SERVICE PROVIDER AND USE OF ESA FOR PREVALENT HD AND PD PATIENTS, 2005 - 2011

		All	%	9 100	1 100	0 100	0 100	100	100	100
			No.	1449	1271	1100	1020	879	757	999
	PTE	No ESA	%	4.9	6.5	5.0	9.9	9.7	5.9	9
	Ь	No	No.	71	82	22	29	85	45	44
		On ESA	%	95.1	93.5	95.0	93.4	90.3	94.1	93.4
		On I	No.	1378	1189	1045	953	794	712	622
		_	%	100	100	100	100	100	100	100
		All	No.	2776	2724	2674	2570	2412	2260	2218
HD + PD	0/	SA	%	11.2	13.2	13.4	9.8	9.7	11.8	0
HD	VWO	No ESA	No.	311	329	359	253	233	266	100
		ESA	%	88.8	86.8	9.98	90.2	90.3	88.2	010
		On ESA	No.	2465	2365	2315	2317	2179	1994	2019
			%	100	100	100	100	100	100	100
		All	No.	665	290	594	280	650	754	665
	PAH	No ESA	%	10.7	11.4	11.4	10.5	11.1	12.3	101
	PΑ	No	No.	71	29	89	61	72	93	67
		On ESA	%	89.3	9.88	9.88	89.5	88.9	7.78	0 08
		On	No.	594	523	526	519	218	661	208
		rear		2011	2010	2009	2008	2007	2006	2005

# 8.10.4 Prevalent HD Patients on ESA by Diabetes Mellitus (DM) status

Consistently, more diabetic HD and PD patients used ESA, as compared to the non-diabetics. See Tables 8.10.4.1a, 1b, 1c.

Table 8.10.4.1a: PREVALENT HD PATIENTS ON ESA USE BY DM STATUS, 2005 - 2011

	All	%	100	6.66	8.66	100	100	6.66	8.66
	A	No.	4268	4015	8448	3228	3255	3061	2858
AII	No ESA	%	6	11.1	10.9	8.8	9.4	10.4	8
A	I ON	No.	386	445	412	315	908	319	230
	On ESA	%	6.06	88.8	68	91.2	9.06	89.5	91.8
	0n l	No.	3882	3570	3367	3260	2949	2742	2628
	All	%	46	47.4	48.9	6'09	23	55.2	8.73
	A	No.	1966	1906	1850	1819	1726	1690	1654
Non-DM	No ESA	%	4.9	6.1	6.2	9.6	6.4	7	5.7
Non	No	No.	210	244	233	201	207	215	163
	On ESA	%	41.1	41.3	42.7	45.3	46.7	48.2	52.1
	uO	No.	1756	1662	1617	1618	1519	1475	1491
	All	%	6.83	52.5	12	1.64	47	44.8	42
	٧	No.	2302	2109	1929	1756	1529	1371	1204
DM	No ESA	%	4.1	2	4.7	3.2	3	3.4	2.3
D	No	No.	176	201	179	114	66	104	67
	On ESA	%	49.8	47.5	46.2	45.9	43.9	41.4	39.7
	On	No.	2126	1908	1750	1642	1430	1267	1137
	Year		2011	2010	2009	2008	2007	2006	2002

Table 8.10.4.1b: PREVALENT PD PATIENTS ON ESA USE BY DM STATUS, 2005 - 2011

			D	DM					Non	Non-DM					All	=		
Year	On	On ESA	No	No ESA	■A	=	On ESA	ESA	No E	No ESA	A	=	On I	On ESA	No ESA	SA	A	_
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2011	318	6.03	45	7.2	363	58.1	236	37.8	22	3.5	258	41.3	554	9.88	29	10.7	621	99.4
2010	277	48.1	41	7.1	318	55.2	230	39.9	22	3.8	252	43.8	202	88	63	10.9	220	66
2009	268	44.9	45	2.7	313	52.4	251	42	25	4.2	276	46.2	519	6.98	20	11.7	289	98.7
2008	278	46.4	35	5.8	313	52.3	251	41.9	31	5.2	282	47.1	529	88.3	99	11	262	99.3
2007	321	46.7	46	2.9	298	23.3	281	40.8	38	5.5	319	46.4	602	9.78	84	12.2	989	2.66
2006	320	49.2	41	5.8	391	99	275	38.7	44	6.2	319	6.44	625	6.78	85	12	710	6.66
2002	333	47.5	37	5.3	370	52.8	278	39.7	43	6.1	321	45.8	611	87.2	80	11.4	691	98.6

PREVALENT HD and PD PATIENTS ON ESA USE BY DM STATUS, 2005 - 2011 Table 8.10.4.1c:

			۵	DM					Non	Non-DM					₹	=		
	On ESA	SA	No	No ESA	Ψ	_	On ESA	ESA	No ESA	SA	A	_	Onl	ESA	No	No ESA	W	_
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
7	2444	49.9	221	4.5	2665	54.4	1992	40.7	232	4.7	2224	45.4	4436	90.6	453	9.3	4889	6.66
2		47.5	242	5.3	2427	52.8	1892	41.2	266	5.8	2158	47	4077	88.7	508	11.1	4585	8.66
2009 20		46.1	224	5.1		51.2	1868	42.6	258	5.9	2126	48.5	3886	88.7	482	11	4368	2.66
	1920	46	149	3.6		49.6	1869	44.8	232	5.6	2101	50.3	3789	8.06	381	9.1	4170	6.66
2007 1		44.4	145	3.7	1896	48.1	1800	45.7	245	6.2	2045	51.9	3551	90.1	390	9.9	3941	6.66
2006 10		42.8	145	3.8	1762	46.7	1750	46.4	259	6.9	2009	53.2	3367	89.2	404	10.7	3771	6.66
7	1470	412	104	2.9	1574	44.2	1769	49.6	206	5.8	1975	55.4	3239	6 06	310	8 7	3549	9 66

# 8.10.5 Level of Haemoglobin (Hb) among Prevalent Dialysis Patients, 2005 – 2011

Over the years analysed, there is a higher proportion of patients achieving a Hb of between 10 - 12 while on ESA. For patients not on ESA, there was an increasing percentage of patients having Hb > 12 g/dl.

In year 2010, the median Hb level was 11.1 g/dl (Range: 5.1 - 17.4) among HD patients, and 10.8 g/dl (Range: 6.4 - 17.4) among PD patients. The percentage of dialysis patients with Hb level greater than 14 g/dl was 1.2% among patients with ESA, and 19.8% among patients without ESA.

In year 2011, the median Hb level was 11.2 g/dl (Range: 5.1 - 17.9) among HD patients, and 10.7 g/dl (Range: 6.8 - 16.8) among PD patients. The percentage of dialysis patients with Hb level greater than 14 g/dl was 1.2% among patients with ESA, and 20.1% among patients without ESA.

In the years from 2005 to 2011, the median Hb level remained relatively stable among prevalent HD and PD patients.

See Tables 8.10.5.1, 8.10.5.2 and 8.10.5.3.

Table 8.10.5.1: HB LEVEL (g/dl) AMONG ALL DIALYSIS PATIENTS, 2005 – 2011

Year	Mode	No	Mean	Median	SD	Range
2011	HD	4267	11.1	11.2	1.5	5.1 – 17.9
	PD	622	10.8	10.7	1.6	6.8 – 16.8
	All	4889	11.0	11.1	1.6	5.1 – 17.9
2010	HD	4014	11.0	11.1	1.5	5.1 – 17.4
	PD	570	10.8	10.8	1.7	6.4 – 17.4
	All	4584	11.0	11.1	1.5	5.1 – 17.4
2009	HD	3777	11.1	11.1	1.5	5.1 – 18.4
	PD	589	10.7	10.6	1.8	6.3 – 19.6
	All	4366	11.0	11.1	1.6	5.1 – 19.6
2008	HD	3572	11.0	11.0	1.7	5.1 –19.3
	PD	593	10.8	10.8	1.8	5.9 – 17.2
	All	4165	10.9	11.0	1.7	5.1 – 19.3
2007	HD	3245	10.8	10.9	1.6	5.1 – 17.6
	PD	679	10.9	10.9	1.8	5.7 – 18.9
	All	3924	10.8	10.9	1.7	5.1 – 18.9
2006	HD	3055	10.8	10.9	1.6	5.0 – 17.4
	PD	704	10.7	10.6	1.8	5.8 – 18.2
	All	3759	10.8	10.8	1.6	5.0 – 18.2
2005	HD	2843	10.8	10.9	1.7	5.1 – 17.7
	PD	691	10.8	10.8	1.8	5.1 – 17.6
	All	3534	10.8	10.9	1.7	5.1 – 17.7

Table 8.10.5.2: HB LEVEL (g/dl) AMONG DIALYSIS PATIENTS ON ESA THERAPY, 2005 - 2011

	HB<7	<b>2</b>	7≤HB<8	B<8	6>BH≥8	3<9	9≤HB<10	1<10	10≤H	10≤HB<11	11≤HB<12	3<12	12≤HB<13	3<13	13≤HB<14	B<14	HB≥14	214	⋖	All
rear	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2011	40	6.0	97	2.2	291	9.9	644	14.5	1069	24.1	1353	30.5	725	16.4	160	3.6	55	1.2	4434	100
2010	30	0.7	93	2.3	303	7.4	589	14.5	1002	24.6	1379	33.8	496	12.2	133	3.3	49	1.2	4074	100
2009	22	9.0	102	2.6	271	7.0	554	14.3	666	25.6	1252	32.3	484	12.5	147	3.8	22	1.5	3882	100
2008	56	0.7	123	3.2	295	7.8	269	15.8	934	24.7	1131	29.9	475	12.5	140	3.7	64	1.7	3785	100
2007	28	1.6	145	4.1	274	7.7	526	14.9	921	26.0	1024	28.9	392	11.1	147	4.2	54	1.5	3541	100
2006	37	1.1	135	4.0	312	9.3	524	15.6	902	26.9	626	28.0	371	11.0	92	2.8	44	1.3	3359	100
2002	45	1.4	131	4.1	291	0.6	525	16.3	761	23.6	862	26.7	412	12.8	135	4.2	63	2.0	3225	100

Table 8.10.5.3: HB LEVEL (g/dl) AMONG DIALYSIS PATIENTS NOT ON ESA THERAPY, 2005 - 2011

300	HB<7	<b>/</b>	7≤HB<8	B<8	6>B≤HB<9	B<9	9≤HB<10	3<10	10≤HB<11	B<11	11≤HB<12	3<12	12≤HB<13	B<13	13≤H	13≤HB<14	HB≥14	214	Η	=
real	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2011	4	6.0	2	0.4	8	1.8	21	4.6	37	8.2	74	16.3	120	26.5	96	21.2	91	20.1	453	100
2010	_	0.2	4	8.0	2	1.0	24	4.7	43	8.5	74	14.6	161	31.8	94	18.6	100	19.8	909	100
2009	2	6.4	3	9.0	10	2.1	22	4.6	30	6.3	69	12.3	166	34.6	108	22.5	80	16.7	480	100
2008	1	6.0	7	1.8	11	2.9	18	4.7	28	7.4	99	17.4	98	22.6	69	18.2	94	24.7	380	100
2007	3	8.0	0	0.0	27	7.0	29	9.7	47	12.3	61	15.9	81	21.1	29	15.4	92	19.8	383	100
2006	2	1.3	13	3.3	14	3.5	25	6.3	44	11.0	78	19.5	84	21.0	99	16.5	71	17.8	400	100
2002	3	1.0	2	1.7	10	3.3	27	9.0	39	13.0	29	19.6	22	18.9	44	14.6	22	18.9	301	100

# 8.10.6 Hb level, stratified by presence of ESA and Transferrin Saturation (TSAT) level, 2005 – 2011

In 2010, the percentage of HD patients on ESA and with TSAT  $\geq$  20% was 88.9% for patients with Hb  $\geq$  10 g/dl, and 76.8% for patients with Hb < 10 g/dl. The corresponding numbers for 2011 were 84.8% and 72.0% respectively.

Similarly, the percentage of PD patients on ESA and with TSAT  $\geq$  20% was 90.2% for patients with Hb  $\geq$  10 g/dl, and 81.1% for patients with Hb < 10 g/dl. The corresponding numbers for 2011 were 81.8% and 75.0% respectively. See Table 8.10.6.1.

Table 8.10.6.1: DIALYSIS PATIENTS WITH HB ≥ 10 g/dl, STRATIFIED BY PRESENCE OF ESA AND TSAT (20%), 2005 – 2011

# (a) Haemodialysis

			With	ESA			Witho	out ESA	
Year	Hb	TSAT	≥20%	TSAT	<20%	TSAT	≥20%	TSA	Γ<20%
		No	%	No	%	No	%	No	%
	≥10	2455	84.8	439	15.2	286	80.8	68	19.2
2011	<10	609	72.0	237	28.0	22	81.5	5	18.5
	All	3064	81.9	676	18.1	308	80.8	73	19.2
	≥10	2353	88.9	293	11.1	330	81.7	74	18.3
2010	<10	611	76.8	185	23.2	17	68.0	8	32.0
	All	2964	86.1	478	13.9	347	80.9	82	19.1
	≥10	2287	91.0	227	9.0	327	87.0	49	13.0
2009	<10	562	80.2	139	19.8	17	94.4	1	5.6
	All	2849	88.6	366	11.4	344	87.3	50	12.7
	≥10	2055	90.0	229	10.0	220	81.2	51	18.8
2008	<10	618	78.4	170	21.6	18	69.2	8	30.8
	All	2673	87.0	399	13.0	238	80.1	59	19.9
	≥10	1684	84.8	303	15.2	202	82.8	42	17.2
2007	<10	529	73.2	194	26.8	23	67.6	11	32.4
	All	2213	81.7	497	18.3	225	80.9	53	19.1
	≥10	1613	89.7	185	10.3	229	87.4	33	12.6
2006	<10	527	79.7	134	20.3	22	81.5	5	18.5
	All	2140	87.0	319	13.0	251	86.9	38	13.1
	≥10	1439	88.6	186	11.4	148	85.1	26	14.9
2005	<10	501	77.7	144	22.3	17	65.4	9	34.6
	All	1940	85.5	330	14.5	165	82.5	35	17.5

Table 8.10.6.1: DIALYSIS PATIENTS WITH HB ≥ 10 g/dl, STRATIFIED BY PRESENCE OF ESA AND TSAT (20%), 2005 – 2011

# (b) Peritoneal dialysis

			With	ESA			Witho	out ESA	
Year	Hb	TSAT	≥20%	TSAT	<20%	TSAT	≥20%	TSAT	T<20%
		No	%	No	%	No	%	No	%
	≥10	297	81.8	66	18.2	49	84.5	9	15.5
2011	<10	132	75.0	44	25.0	5	62.5	3	37.5
	All	429	79.6	110	20.4	54	81.8	12	18.2
	≥10	293	90.2	32	9.8	53	93.0	4	7.0
2010	<10	142	81.1	33	18.9	3	100.0	0	0.0
	All	435	87.0	65	13.0	56	93.3	4	6.7
	≥10	289	89.2	35	10.8	47	88.7	6	11.3
2009	<10	151	82.1	33	17.9	10	83.3	2	16.7
	All	440	86.6	68	13.4	57	87.7	8	12.3
	≥10	271	80.9	64	19.1	48	85.7	8	14.3
2008	<10	153	85.5	26	14.5	5	100.0	0	0.0
	All	424	82.5	90	17.5	53	86.9	8	13.1
	≥10	338	85.4	58	14.6	50	89.3	6	10.7
2007	<10	128	78.5	35	21.5	12	80.0	3	20.0
	All	466	83.4	93	16.6	62	87.3	9	12.7
	≥10	331	87.6	47	12.4	53	91.4	5	8.6
2006	<10	184	82.5	39	17.5	17	85.0	3	15.0
	All	515	85.7	86	14.3	70	89.7	8	10.3
	≥10	325	85.1	57	14.9	57	93.4	4	6.6
2005	<10	145	78.4	40	21.6	7	63.6	4	36.4
	All	470	82.9	97	17.1	64	88.9	8	11.1

# (c) Haemodialysis and Peritoneal dialysis

			With	ESA			Witho	out ESA	
Year	Hb	TSAT	≥20%	TSAT	<20%	TSAT	≥20%	TSAT	<20%
		No	%	No	%	No	%	No	%
	≥10	2752	84.5	505	15.5	335	81.3	77	18.7
2011	<10	741	72.5	281	27.5	27	77.1	8	22.9
	All	3493	81.6	786	18.4	362	81.0	85	19.0
	≥10	2646	89.1	325	10.9	383	83.1	78	16.9
2010	<10	753	77.5	218	22.5	20	71.4	8	28.6
	All	3399	86.2	543	13.8	403	82.4	86	17.6
	≥10	2576	90.8	262	9.2	374	87.2	55	12.8
2009	<10	713	80.6	172	19.4	27	90.0	3	10.0
	All	3289	88.3	434	11.7	401	87.4	58	12.6
	≥10	2326	88.8	293	11.2	268	82.0	59	18.0
2008	<10	771	79.7	196	20.3	23	74.2	8	25.8
	All	3097	86.4	489	13.6	291	81.3	67	18.7
	≥10	2022	84.9	361	15.1	252	84.0	48	16.0
2007	<10	657	74.2	229	25.8	35	71.4	14	28.6
	All	2679	82.0	590	18.0	287	82.2	62	17.8
	≥10	1944	89.3	232	10.7	282	88.1	38	11.9
2006	<10	711	80.4	173	19.6	39	83.0	8	17.0
	All	2655	86.8	405	13.2	321	87.5	46	12.5
	≥10	1764	87.9	243	12.1	205	87.2	30	12.8
2005	<10	646	77.8	184	22.2	24	64.9	13	35.1
	All	2410	84.9	427	15.1	229	84.2	43	15.8

## 8.10.7 Ferritin Level (ng/ml), stratified by presence of ESA and Hb level, 2005 – 2011

A significant proportion of patients can be considered iron deficient based on Ferritin results of  $\leq$  200 ng/ml for HD patients and  $\leq$  100 ng/ml for PD patients.

In year 2010, 16.2% of the HD patients on ESA with Hb  $\geq$  10 g/dl and 16.1% of those with Hb < 10 g/dl had serum ferritin level of 200 ng/ml or less. The corresponding figures for 2011 were 18.2% and 16.8% respectively. Patients not on ESA in 2010 with Hb  $\geq$  10 g/dl accounted for 40.9% while those with Hb < 10 g/dl made up 16.0%. The corresponding figures for 2011 were 44.5% and 18.5% respectively.

In year 2010, 4.0% of the PD patients on ESA with Hb  $\geq$  10 g/dl and 5.7% of those with Hb < 10 g/dl had serum ferritin level of 100 ng/ml or less. The corresponding figures for 2011 were 5.8% and 2.4% respectively. Patients not on ESA in 2010 with Hb  $\geq$  10 g/dl accounted for 8.8% while no patients with Hb < 10 g/dl were recorded. Patients not on ESA in 2011 with Hb  $\geq$  10 g/dl accounted for 9.1% while those with Hb < 10 g/dl made up 28.6%. The numbers in peritoneal dialysis is very small and should not be analysed.

Table 8.10.7.1.a: DIALYSIS PATIENTS AT SPECIFIED FERRITIN LEVEL (ng/ml), STRATIFIED BY PRESENCE OF ESA AND HB LEVEL, 2011

					HD				PD			Н	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Witho	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	182	6.3	96	27.0	20	5.8	5	9.1	202	6.2	101	24.6
		100-200	345	11.9	62	17.5	33	9.6	8	14.5	378	11.6	70	17.1
		201–500	1123	38.7	107	30.1	93	27.2	21	38.2	1216	37.4	128	31.2
		501-800	759	26.1	60	16.9	65	19.0	11	20.0	824	25.4	71	17.3
		>800	496	17.1	30	8.5	131	38.3	10	18.2	627	19.3	40	9.8
	<10	<100	59	7.0	3	1.1	4	2.4	2	8.6	63	6.2	5	14.7
		100–200	83	9.8	2	7.4	3	1.8	0	0.0	86	8.4	2	5.9
2011		201–500	284	33.5	9	33.3	44	25.9	0	0.0	328	32.2	9	26.5
		501-800	206	24.3	3	11.1	42	24.7	2	28.6	248	24.4	5	14.7
		>800	216	25.5	10	37.0	77	45.3	3	42.9	293	28.8	13	38.2
	All	<100	241	6.4	99	25.9	24	4.7	7	11.3	265	6.2	106	23.9
		100-200	428	11.4	64	16.8	36	7.0	8	12.9	464	10.9	72	16.2
		201–500	1407	37.5	116	30.4	137	26.8	21	33.9	1544	36.2	137	30.9
		501-800	965	25.7	63	16.5	107	20.9	13	21.0	1072	25.1	76	17.1
		>800	714	19.0	40	10.5	208	40.6	13	21.0	922	21.6	53	11.9

Table 8.10.7.1.b: DIALYSIS PATIENTS AT SPECIFIED FERRITIN LEVEL (ng/ml), STRATIFIED BY PRESENCE OF ESA AND HB LEVEL, 2009 – 2010

				I	HD				PD			Н	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	132	5.0	106	26.3	13	4.0	5	8.8	145	4.9	111	24.1
		100–200	295	11.2	59	14.6	22	6.8	11	19.3	317	10.7	70	15.2
		201–500	1003	38.0	128	31.8	73	22.6	15	26.3	1076	36.3	143	31.1
		501–800	720	27.3	67	16.6	85	26.3	1	1.8	805	27.2	68	14.8
		>800	490	18.6	43	10.7	130	40.2	25	43.9	620	20.9	68	14.8
	<10	<100	59	7.4	1	4.0	10	5.7	0	0.0	69	7.1	1	3.6
		100–200	69	8.7	3	12.0	12	6.8	0	0.0	81	8.3	3	10.7
2010		201–500	231	29.0	9	36.0	43	24.4	0	0.0	274	28.2	9	32.1
		501-800	213	26.8	5	20.0	46	26.1	1	33.3	259	26.6	6	21.4
		>800	224	28.1	7	28.0	65	36.9	2	66.7	289	29.7	9	32.1
	All	<100	191	5.6	107	25.0	23	4.6	5	8.3	214	5.4	112	23.0
		100–200	364	10.6	62	14.5	34	6.8	11	18.3	398	10.1	73	15.0
		201–500	1234	35.9	137	32.0	116	23.2	15	25.0	1350	34.3	152	31.1
		501–800	933	27.2	72	16.8	131	26.3	2	3.3	1064	27.0	74	15.2
		>800	714	20.8	50	11.7	195	39.1	27	45.0	909	23.1	77	15.8

					HD				PD			Н	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	137	5.5	78	20.8	19	5.9	6	11.5	156	5.5	84	19.7
		100–200	259	10.3	52	13.9	25	7.8	5	9.6	284	10.0	57	13.3
		201–500	988	39.3	140	37.3	89	27.7	17	32.7	1077	38.0	157	36.8
		501-800	698	27.8	74	19.7	74	23.1	11	21.2	772	27.3	85	19.9
		>800	429	17.1	31	8.3	114	35.5	13	25.0	543	19.2	44	10.3
	<10	<100	35	5.0	1	5.3	11	6.1	0	0.0	46	5.2	1	3.2
		100–200	63	9.0	3	15.8	16	8.9	2	16.7	79	8.9	5	16.1
2009		201–500	244	34.7	5	26.3	42	23.3	1	8.3	286	32.4	6	19.4
		501–800	162	23.0	2	10.5	42	23.3	4	33.3	204	23.1	6	19.4
		>800	199	28.3	8	42.1	69	38.3	5	41.7	268	30.4	13	41.9
	All	<100	172	5.3	79	20.0	30	6.0	6	9.4	202	5.4	85	18.5
		100–200	322	10.0	55	13.9	41	8.2	7	10.9	363	9.8	62	13.5
		201–500	1233	38.4	145	36.7	131	26.1	18	28.1	1364	36.7	163	35.5
		501–800	860	26.7	77	19.5	116	23.2	15	23.4	976	26.3	92	20.0
		>800	628	19.5	39	9.9	183	36.5	18	28.1	811	21.8	57	12.4

Table 8.10.7.1.c: DIALYSIS PATIENTS AT SPECIFIED FERRITIN LEVEL (ng/ml), STRATIFIED BY PRESENCE OF ESA AND HB LEVEL, 2007 – 2008

					HD				PD			HE	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	134	5.9	81	29.9	20	6.1	8	15.4	154	5.9	89	27.6
		100–200	279	12.2	42	15.5	27	8.3	5	9.6	306	11.7	47	14.6
		201–500	972	42.5	87	32.1	98	30.0	14	26.9	1070	40.9	101	31.3
		501-800	559	24.4	38	14.0	66	20.2	10	19.2	625	23.9	48	14.9
		>800	344	15.0	23	8.5	116	35.5	15	28.8	460	17.6	38	11.8
	<10	<100	42	5.3	3	2.0	9	5.2	2	50.0	51	5.3	5	17.2
2008		100–200	76	9.6	1	4.0	18	10.4	0	0.0	94	9.8	1	3.4
		201–500	304	38.4	8	32.0	46	26.6	0	0.0	350	36.3	8	27.6
		501–800	194	24.5	3	12.0	36	20.8	0	0.0	230	23.9	3	10.3
		>800	175	22.1	10	40.0	64	37.0	2	50.0	239	24.8	12	41.4
	All	<100	176	5.7	84	28.4	29	5.8	10	17.9	205	5.7	94	26.7
		100–200	355	11.5	43	14.5	45	9.0	5	8.9	400	11.2	48	13.6
		201–500	1277	41.5	95	32.1	144	28.7	14	25.0	1421	39.7	109	31.0
		501–800	753	24.4	41	13.9	102	20.4	10	17.9	855	23.9	51	14.5
		>800	519	16.9	33	11.1	181	36.1	17	30.4	700	19.5	50	14.2

				I	HD			I	PD			HE	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	139	6.9	58	23.5	25	6.5	4	7.8	164	6.9	62	20.8
		100–200	265	13.2	45	18.2	44	11.5	4	7.8	309	12.9	49	16.4
		201–500	806	40.2	90	36.4	104	27.2	13	25.5	910	38.1	103	34.6
		501-800	535	26.7	34	13.8	85	22.2	15	29.4	620	26.0	49	16.4
		>800	260	13.0	20	8.1	125	32.6	15	29.4	385	16.1	35	11.7
	<10	<100	50	6.8	3	8.8	12	7.6	2	14.3	62	7.0	5	10.4
		100–200	92	12.6	3	8.8	18	11.5	1	7.1	110	12.4	4	8.3
2007		201–500	268	36.7	16	47.1	38	24.2	5	5.7	306	34.5	21	43.8
		501-800	179	24.5	7	20.6	38	24.2	1	7.1	217	24.5	8	16.7
		>800	141	19.3	5	14.7	51	32.5	5	35.7	192	21.6	10	20.8
	All	<100	189	6.9	61	21.6	37	6.8	6	9.1	226	6.9	67	19.3
		100–200	357	13.0	48	17.0	62	11.5	5	7.6	419	12.8	53	15.2
		201–500	1075	39.3	106	37.6	142	26.2	19	28.8	1217	37.1	125	35.9
		501–800	715	26.1	42	14.9	124	22.9	16	24.2	839	25.6	58	16.7
		>800	401	14.7	25	8.9	176	32.5	20	30.3	577	17.6	45	12.9

Table 8.10.7.1.d: DIALYSIS PATIENTS AT SPECIFIED FERRITIN LEVEL (ng/ml), STRATIFIED BY PRESENCE OF ESA AND HB LEVEL, 2005 – 2006

					HD				PD			Н	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	137	7.4	74	27.9	23	6.2	9	16.1	160	7.2	83	25.9
		100-200	222	12.1	45	17.0	49	13.3	6	10.7	271	12.3	51	15.9
		201–500	779	42.4	99	37.4	121	32.8	19	33.9	900	40.8	118	36.8
		501-800	464	25.2	29	10.9	83	22.5	13	23.2	547	24.8	42	13.1
		>800	237	12.9	18	6.8	93	25.2	9	16.1	330	14.9	27	8.4
	<10	<100	57	8.7	5	18.5	14	6.3	3	15.8	71	8.1	8	17.4
		100-200	75	11.4	4	14.8	26	11.8	2	10.5	101	11.5	6	13.0
2006		201–500	256	38.9	12	44.4	61	27.6	6	31.6	317	36.1	18	39.1
		501-800	144	21.9	2	7.4	55	24.9	3	15.8	199	22.6	5	10.9
		>800	126	19.1	4	14.8	65	29.4	5	26.3	191	21.7	9	19.6
	All	<100	195	7.8	79	27.1	37	6.3	12	16.0	232	7.5	91	24.8
		100–200	298	11.9	49	16.8	75	12.7	8	10.7	373	12.1	57	15.5
		201–500	1035	41.4	111	38.0	183	30.9	25	33.3	1218	39.4	136	37.1
		501–800	610	24.4	31	10.6	138	23.3	16	21.3	748	24.2	47	12.8
		>800	363	14.5	22	7.5	159	26.9	14	18.7	522	16.9	36	9.8

					HD				PD			Н	)+PD	
Year	Hb	Ferritin	With	ESA	Withou	ut ESA	With	ESA	Withou	ut ESA	With	ESA	Witho	ut ESA
			No	%	No	%	No	%	No	%	No	%	No	%
	≥10	<100	85	5.1	55	31.6	32	8.7	4	6.6	117	5.8	59	25.1
		100–200	141	8.5	20	11.5	33	9.0	7	11.5	174	8.6	27	11.5
		201–500	538	32.3	54	31.0	109	29.8	17	27.9	647	31.8	71	30.2
		501–800	515	30.9	28	16.1	78	21.3	15	24.6	593	29.2	43	18.3
		>800	387	23.2	17	9.8	114	31.1	18	29.5	501	24.7	35	14.9
	<10	<100	47	7.1	4	17.4	16	8.9	0	0.0	63	7.5	4	11.4
		100-200	71	10.7	2	8.7	19	10.6	2	16.7	90	10.7	4	11.4
2005		201–500	203	30.6	6	26.1	51	28.3	4	33.3	254	30.1	10	28.6
		501–800	166	25.0	2	8.7	29	16.1	3	25.0	195	23.1	5	14.3
		>800	177	26.7	9	39.1	65	36.1	3	25.0	242	28.7	12	34.3
	All	<100	132	5.7	59	29.5	48	8.7	4	5.5	180	6.2	63	23.1
		100–200	212	9.1	23	11.5	53	9.7	9	12.3	265	9.2	32	11.7
		201–500	743	31.8	60	30.0	161	29.3	21	28.8	904	31.4	81	29.7
		501–800	682	29.2	32	16.0	107	19.5	18	24.7	789	27.4	50	18.3
		>800	565	24.2	26	13.0	180	32.8	21	28.8	745	25.8	47	17.2

# 8.10.8 Hb level among Dialysis Patients stratified by TSAT and ESA, 2005 – 2011

Regardless of modality and level of TSAT, the median Hb level among prevalent patients without ESA was higher than prevalent patients with ESA in the period 2005 – 2011.

Table 8.10.8.1: MEDIAN HB LEVEL BY PRESENCE OF ESA AND TSAT LEVEL, 2005 – 2011

Voor	TOAT		With ESA			Without ESA	
Year	TSAT	HD	PD	Both	HD	PD	Both
	<20%	10.6	10.3	10.6	12.5	11.8	12.5
2011	≥20%	11.2	10.7	11.1	12.8	12.4	12.7
	All	11.1	10.6	11.0	12.7	12.4	12.6
	<20%	10.4	9.9	10.3	12.5	12.6	12.5
2010	≥20%	11.1	10.7	11.0	12.6	12.1	12.6
	All	11.0	10.6	11.0	12.5	12.1	12.5
	<20%	10.4	10.1	10.4	12.7	11.8	12.6
2009	≥20%	11.1	10.6	11.0	12.6	11.7	12.5
	All	11.0	10.5	10.9	12.6	11.9	12.5
	<20%	10.3	10.7	10.3	12.8	12.4	12.8
2008	≥20%	11.0	10.6	10.9	12.8	11.8	12.7
	All	10.9	10.6	10.9	12.7	11.9	12.6
	<20%	10.4	10.6	10.4	12.2	10.4	12.1
2007	≥20%	10.9	10.8	10.9	12.5	11.7	12.3
	All	10.8	10.8	10.8	12.4	11.6	12.2
	<20%	10.3	10.1	10.2	12.9	12.0	12.8
2006	≥20%	10.8	10.6	10.8	12.6	11.3	12.3
	All	10.8	10.5	10.7	12.5	11.4	12.2
	<20%	10.3	10.3	10.3	11.7	10.0	11.4
2005	≥20%	10.9	10.8	10.9	12.6	11.6	12.3
	All	10.8	10.7	10.8	12.4	11.3	12.2

# 8.10.9 Distribution of Dialysis Patients by EPO route and Hb level, 2005 – 2008

In 2008, 90.0% of the HD patients had EPO delivered via intravenous route (IV), and all of the PD patients had EPO delivered via SC.

Table 8.10.9.1: EPO ROUTE AND HB LEVEL, 2005 – 2008

# (a) Haemodialysis

Year	Hb	l\	/	S	С	IV+	·sc	Unk	nown	А	II
I Gai	110	No	%	No	%	No	%	No	%	No	%
	≥10	2178	90.8	221	9.2	2399	100.0	0	0.0	2399	100
2008	<10	755	87.9	104	12.1	859	100.0	0	0.0	859	100
	All	2933	90.0	325	10.0	3258	100.0	0	0.0	3258	100
	≥10	1936	91.5	179	8.5	2115	100.0	0	0.0	2115	100
2007	<10	694	83.9	133	16.1	827	100.0	0	0.0	827	100
	All	2630	89.4	312	10.6	2942	100.0	0	0.0	2942	100
	≥10	1778	90.7	182	9.3	1960	99.9	1	0.1	1961	100
2006	<10	667	86.0	109	14.0	776	100.0	0	0.0	776	100
	All	2445	89.3	291	10.6	2736	100.0	1	0.0	2737	100
	≥10	1660	91.1	163	8.9	1823	100.0	0	0.0	1823	100
2005	<10	674	84.9	120	15.1	794	100.0	0	0.0	794	100
	All	2334	89.2	283	10.8	2617	100.0	0	0.0	2617	100

# (b) Peritoneal Dialysis

Year	Hb	l,	V	S	C	IV+	-sc	Unk	nown	Α	.II
I Gai	110	No	%	No	%	No	%	No	%	No	%
	≥10	0	0.0	345	100.0	345	100.0	0	0.0	345	100
2008	<10	0	0.0	182	100.0	182	100.0	0	0.0	182	100
	All	0	0.0	527	100.0	527	100.0	0	0.0	527	100
	≥10	0	0.0	423	100.0	423	100.0	0	0.0	423	100
2007	<10	0	0.0	176	100.0	176	100.0	0	0.0	176	100
	All	0	0.0	599	100.0	599	100.0	0	0.0	599	100
	≥10	0	0.0	390	100.0	390	100.0	0	0.0	390	100
2006	<10	0	0.0	231	99.6	231	99.6	1	0.4	232	100
	All	0	0.0	621	99.8	621	99.8	1	0.2	622	100
	≥10	1	0.2	409	99.8	410	100.0	0	0.0	410	100
2005	<10	0	0.0	198	100.0	198	100.0	0	0.0	198	100
	All	1	0.2	607	99.8	608	100.0	0	0.0	608	100

<sup>\*</sup> Note: No more EPO route data collected from 2009 onwards

# (c) Haemodialysis and Peritoneal Dialysis

Year	Hb	l l	V	S	С	IV+	·sc	Unk	nown	А	.II
I Cai	110	No	%	No	%	No	%	No	%	No	%
	≥10	2178	79.4	566	20.6	2744	100.0	0	0.0	2744	100
2008	<10	755	72.5	286	27.5	1041	100.0	0	0.0	1041	100
	All	2933	77.5	852	22.5	3785	100.0	0	0.0	3785	100
	≥10	1936	76.3	602	23.7	2538	100.0	0	0.0	2538	100
2007	<10	694	69.2	309	30.8	1003	100.0	0	0.0	1003	100
	All	2630	74.3	911	25.7	3541	100.0	0	0.0	3541	100
	≥10	1778	75.6	572	24.3	2350	100.0	1	0.0	2351	100
2006	<10	667	66.2	340	33.7	1007	99.9	1	0.1	1008	100
	All	2445	72.8	912	27.2	3357	99.9	2	0.1	3359	10
	≥10	1661	74.4	572	25.6	2233	100.0	0	0.0	2233	100
2005	<10	674	67.9	318	32.1	992	100.0	0	0.0	992	100
	All	2335	72.4	890	27.6	3225	100.0	0	0.0	3225	100

<sup>\*</sup> Note: No more EPO route data collected from 2009 onwards

## 8.10.10 Median Hb level by EPO Route

Regardless of modality, the median Hb level was similar among prevalent dialysis patients on IV or SC. In 2008, the median Hb level among HD patients was 10.9 g/dl for those on IV, and 11.0 g/dl for those on SC. The median Hb level among PD patients was 10.6 g/dl for those on IV, and 10.6 g/dl for those on SC. See Table 8.10.10.1

Table 8.10.10.1: MEDIAN HB LEVEL (g/dL) BY EPO ROUTE, 2005 – 2008

Year	EPO Route	HD	PD	HD+PD
	IV	10.9	_	10.9
	SC	11.0	10.6	10.8
2008	IV+SC	10.9	10.6	10.9
	unknown	_	-	-
	All	10.9	10.6	10.9
	IV	10.8	_	10.8
	SC	10.4	10.8	10.7
2007	IV+SC	10.8	10.8	10.8
	unknown	_	_	_
	All	10.8	10.8	10.8
	IV	10.8	_	10.8
	SC	10.5	10.5	10.5
2006	IV+SC	10.8	10.5	10.7
	unknown	11.4	8.4	9.9
	All	10.8	10.5	10.7
	IV	10.9	12.6	10.9
	SC	10.4	10.7	10.6
2005	IV+SC	10.8	10.7	10.8
	unknown	_	_	_
	All	10.8	10.7	10.8

<sup>\*</sup> Note: No more EPO route data collected from 2009 onwards

# 8.11 Nutrition Status of Dialysis Patients

#### 8.11.1 Data Response Rates for Prevalent HD and PD Patients

Regardless of the modality patients are on, albumin data is captured for more than 98% of the patients. In year 2011, 99.8% of the HD patients and 99.5% of the PD patients have data on albumin.

Table 8.11.1.1: DATA RESPONSE RATE FOR PREVALENT DIALYSIS PATIENTS, 2005 – 2011

Year	All HD F	Patients	Albu	ımin	All PD F	Patients	Albu	ımin
Teal	No	%	No	%	No	%	No	%
2011	4270	100	4261	99.8	625	100	622	99.5
2010	4020	100	3999	99.5	576	100	570	99.0
2009	3785	100	3774	99.7	597	100	587	98.3
2008	3575	100	3548	99.2	599	100	595	99.3
2007	3255	100	3227	99.1	688	100	681	99.0
2006	3063	100	3027	98.8	711	100	702	98.7
2005	2864	100	2818	98.4	701	100	692	98.7

# 8.11.2 Serum Albumin Level among Dialysis Patients, 2005 – 2011

The average serum albumin level among the PD patients is lower than that among the HD patients. In year 2011, the mean serum albumin level is 35.0 g/L for the HD patients and 30.2 g/L for the PD patients. There was only a slight variation in the level across the years.

Table 8.11.2.1: SERUM ALBUMIN LEVEL (g/L) AMONG ALL DIALYSIS PATIENTS, 2005 – 2011

Year			HD			PD					
Teal	No	Mean	Median	SD	Range	No	Mean	Median	SD	Range	
2011	4261	35.0	35.0	4.7	10 – 52	622	30.2	31.0	5.8	11 – 48	
2010	3999	35.0	35.0	4.3	11 – 49	570	30.0	30.0	5.5	13 – 48	
2009	3774	34.6	35.0	4.4	12 – 50	587	30.2	30.0	5.7	11 – 47	
2008	3548	34.4	34.0	4.3	11 – 49	595	29.8	30.0	5.5	10 – 50	
2007	3227	34.5	35.0	4.3	11 – 49	681	29.7	30.0	5.4	10 – 48	
2006	3027	36.0	36.0	4.1	10 – 49	702	30.7	31.0	5.8	10 – 50	
2005	2818	36.2	36.0	4.3	10 – 50	692	31.2	31.0	5.3	13 – 50	

# 8.12 Management of Renal Bone Disease in Prevalent Dialysis Patients

#### 8.12.1 Data Response Rates for Prevalent HD and PD Patients

Among the HD patients, data for corrected calcium and phosphate is captured for more than 99% of the patients for all years in the data collection period of 2008 to 2011. Data capture for iPTH increased from 92.4% in year 2008 to 96.6% in year 2011.

Among the PD patients, data for corrected calcium and phosphate is captured for more than 98% of the patients for all years in the data collection period of 2008 to 2011. Data capture for iPTH hovered at about 95% for all years in 2008 – 2011.

Table 8.12.1.1: DATA RESPONSE RATE FOR PREVALENT HD PATIENTS, 2008–2011

Year	All HD F	Patients	Corrected	d Calcium	Phos	phate	iP'	TH
Tear	No	%	No	%	No	%	No	%
2011	4270	100	4260	99.8	4265	99.9	4125	96.6
2010	4020	100	3998	99.5	4006	99.7	3861	96.0
2009	3785	100	3770	99.6	3773	99.7	3605	95.2
2008	3575	100	3549	99.3	3561	99.6	3303	92.4

Year	All HD F	Patients	Corrected Calcium		Phos	phate	iPTH		
Teal	No	%	No	%	No	%	No	%	
2011	625	100	621	99.4	622	99.5	596	95.4	
2010	576	100	570	99.0	570	99.0	549	95.3	
2009	597	100	587	98.3	586	98.2	559	93.6	
2008	599	100	593	99.0	593	99.0	564	94.2	

# 8.12.2 Corrected Calcium Level among Dialysis Patients, 2008 – 2011

The mean corrected calcium level among the HD and PD patients remains constant at 2.4 mmol/L across the years in 2008 – 2011.

Table 8.12.2.1: CORRECTED CALCIUM LEVEL (mmol/L) AMONG DIALYSIS PATIENTS, 2008 – 2011

Year			HD			PD					
Icai	No	Mean	Median	SD	Range	No	Mean	Median	SD	Range	
2011	4260	2.3	2.3	0.2	1.1 – 3.7	621	2.4	2.4	0.2	1.8 – 3.5	
2010	3998	2.3	2.3	0.2	1.3 – 3.1	570	2.4	2.4	0.2	1.2 - 3.4	
2009	3770	2.3	2.3	0.2	1.2 - 3.5	587	2.4	2.5	0.2	1.7 – 3.8	
2008	3549	2.3	2.3	0.2	1.2 - 3.4	593	2.4	2.4	0.2	1.5 – 3.1	

# 8.12.3 Phosphate Level among Dialysis Patients, 2008 – 2011

Among the HD and PD patients, the mean phosphate level is about 1.6 mmol/L across the years in 2008 – 2011.

Table 8.12.3.1: PHOSPHATE LEVEL (mmol/L) AMONG DIALYSIS PATIENTS, 2008 – 2011

Year			HD			PD					
I Cai	No	Mean	Median	SD	Range	No	Mean	Median	SD	Range	
2011	4265	1.6	1.6	0.5	0.3 - 3.9	622	1.5	1.4	0.5	0.5 - 3.7	
2010	4006	1.6	1.6	0.5	0.2 - 3.9	570	1.6	1.5	0.5	0.4 - 3.8	
2009	3773	1.6	1.6	0.5	0.3 - 4.2	586	1.6	1.5	0.5	0.4 - 3.8	
2008	3561	1.6	1.6	0.5	0.2 - 3.9	593	1.6	1.5	0.6	0.4 - 3.6	

# 8.12.4 Serum iPTH Level among Dialysis Patients, 2008 – 2011

Among the HD and PD patients, the average iPTH level is similar. It is also observed that the iPTH values can be unusually elevated. The median iPTH level hovered at 25 pmol/L among the HD patients, and at 27 pmol/L among the PD patients. In year 2011, the median iPTH level for HD patients was 24.7 pmol/L (Range: 0.1 - 431), and for PD patients was 27.6 pmol/L (Range: 0.1 - 327).

Table 8.12.4.1: iPTH LEVEL (pmol/L) AMONG DIALYSIS PATIENTS, 2008 – 2011

Year			HD			PD					
Icai	No	Mean	Median	SD	Range	No	Mean	Median	SD	Range	
2011	4125	41.9	24.7	52.3	0.1 – 431	596	39.3	27.6	43.6	0.1 – 327	
2010	3861	41.6	23.9	53.5	0.1 – 504	549	42.3	27.0	48.9	0.2 – 326	
2009	3605	42.1	25.4	52.2	0.1 – 471	559	42.7	27.3	50.6	0.5 – 381	
2008	3303	43.9	25.6	54.7	0.1 – 449	564	43.0	27.3	52.3	0.3 – 469	

#### 9 THE TRANSPLANT POPULATION

#### 9.1 Incidence and Prevalence

In 2010, 61 (CR 16.2 pmp) renal transplants were performed in Singapore. In addition, 23 patients received transplants overseas in 2010, bringing the total of newly transplanted patients to 84 in 2010. In 2011, 67 (CR 17.7 pmp) renal transplants were performed in Singapore. In addition, 24 patients received transplants overseas in 2011, bringing the total of newly transplanted patients to 91 in 2011. See Table 9.1.1.

The prevalent renal transplant population at the end of 2009 was 1318 (CR 353.0 pmp). There were 18 deaths in 2010. In addition, there were 23 (CR 6.1 pmp) transplant patients who returned to dialysis in 2010. After taking into account the patient deaths and graft losses, there were 1364 (CR 361.6 pmp; ASR 265.1 pmp) prevalent renal transplant patients at the end of 2010.

There were 20 deaths in 2011. In addition, there were 32 (CR 8.4 pmp) transplant patients who returned to dialysis in 2011. After taking into account the patient deaths and graft losses, there were 1403 (CR 370.3 pmp; ASR 266.4 pmp) prevalent renal transplant patients at the end of 2011.

In comparison to international statistics\*, the prevalent transplant populations in Singapore in 2011 was higher than that of New Zealand (325/pmp), Australia (361/pmp), Denmark (363/pmp), but lower than France (509/pmp), Hong Kong (458/pmp), Norway (591/pmp), Spain (495/pmp), Sweden (497/pmp) and USA (562/pmp).

<sup>\*</sup> The paragraph above is with reference to: United States Renal Data System (USRDS), 2011 Annual Data Report. All rates were unadjusted.

Table 9.1.1: INCIDENT AND PREVALENT TRANSPLANT PATIENTS

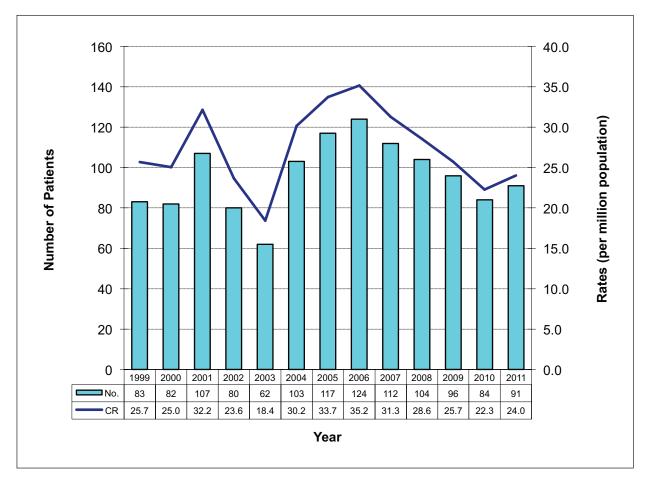
		2010								
	Incident F	Population	Outcome	e Post Trans	plant	<b>Prevalent Population</b>				
	Transplanted in Singapore	Transplanted Overseas	Death with Functioning Graft	Death and Graft Failure	Year End Prevalence					
Number	61	23	18	0	23	1364				
CR*	16.2	6.1	4.8	0.0	6.1	361.6				
ASR*	_	_	_	_	_	265.1				

		2011							
	Incident F	Population	Outcome	e Post Trans	Prevalent Population				
	Transplanted in Singapore	Transplanted Overseas	Death with Functioning Graft	Death and Graft Failure	Year End Prevalence				
Number	67	24	18	2	32	1403			
CR*	17.7	6.3	4.8	0.5	8.4	370.3			
ASR*	_	_	_	_	_	266.4			

<sup>\*</sup> per million residential population.

The number of incident transplant patients was at its lowest in 2003 over the period of analysis between 1999 to 2011 likely due to the SARS epidemic in Singapore that prevented delivery of some elective medical services. The corresponding crude rates for incident transplant patients increased from 25.7 pmp in 1999 to 35.2 pmp in 2006 except for a notable drop to 18.4 pmp in 2003 and was stable from 2009 - 2011. See Figure 9.1.1.

Figure 9.1.1: CRUDE RATE AND TOTAL NUMBER OF INCIDENT TRANSPLANT PATIENTS, 1999 – 2011



The mean age of incident transplant patients was 46.5 years in 2010 and 47.8 in 2011. The mean age for male and female incident transplants were 48.5 and 44.4 years respectively in 2010 and 49.0 and 46.1 years respectively in 2011. Of note was the increasing age for all incident transplant patients: the mean age increased from about 42.9 years old in 1999 to 47.8 years old in 2011. See Figure 9.1.2.

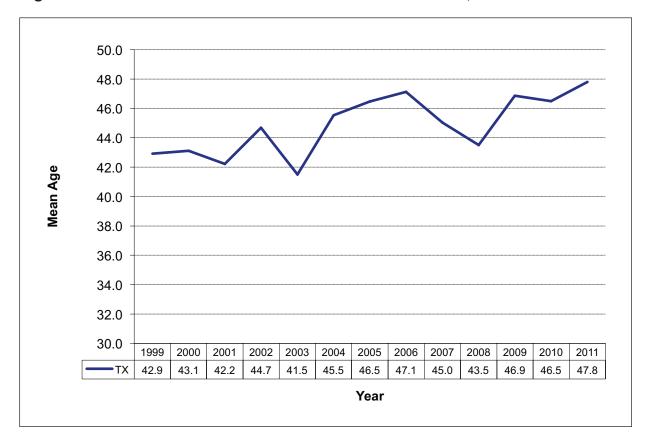


Figure 9.1.2: AGE OF INCIDENT TRANSPLANT PATIENTS, 1999 – 2011

# 9.1.1 Incident Transplant Patients by Age Group and Gender

In 2010, 50.0% of incident transplant patients were males. While in 2011, 58.2% were males. Among all incident patients who received transplants in 2010 and 2011, the majority were of the age group 40 to 59 years. See Table 9.1.1.1. The increasing age of incident transplant patients in the period 1999 – 2011 is also evident in Figure 9.1.1.1. Notably, in 2006 and 2011, more that 50% of incident transplant patients were older than age 49.

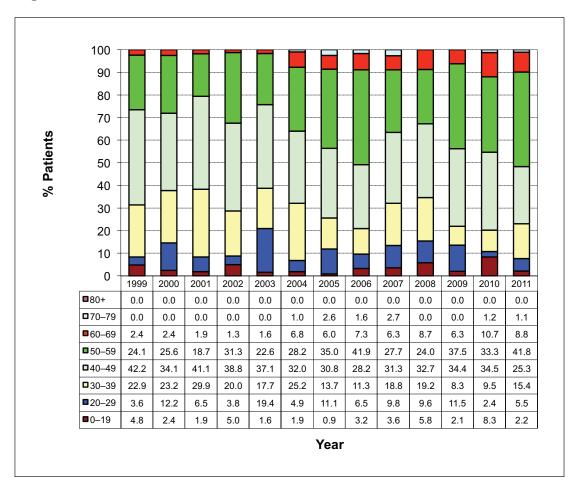
Table 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER, 2010

	2010							
AGE GROUP	Male		Fen	Female		Genders		
	No	%	No	%	No	%		
0–19	3	7.1	4	9.5	7	8.3		
20–29	0	0.0	2	4.8	2	2.4		
30–39	3	7.1	5	11.9	8	9.5		
40–49	16	38.1	13	31.0	29	34.5		
50–59	12	28.6	16	38.1	28	33.3		
60–69	7	16.7	2	4.8	9	10.7		
70–79	1	2.4	0	0.0	1	1.2		
80+	0	0.0	0	0.0	0	0.0		
All Age Groups	42	100	42	100	84	100		

Table 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER, 2011

	2011							
AGE GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
0–19	0	0.0	2	5.3	2	2.2		
20–29	2	3.8	3	7.9	5	5.5		
30–39	10	18.9	4	10.5	14	15.4		
40–49	15	28.3	8	21.1	23	25.3		
50–59	20	37.7	18	47.4	38	41.8		
60–69	5	9.4	3	7.9	8	8.8		
70–79	1	1.9	0	0.0	1	1.1		
80+	0	0.0	0	0.0	0	0.0		
All Age Groups	53	100	38	100	91	100		

Figure 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP, 1999 – 2011



# 9.1.2 Incident Transplant Patients by Ethnic Group and Gender

In 2010, 78.6% of incident transplant patients were Chinese. While in 2011, 75.8% were Chinese. The percentage of Malay incident transplant was 15.5% in 2010 and 12.1% in 2011. See Table 9.1.2.1.

Table 9.1.2.1: INCIDENT TRANSPLANT PATIENTS BY ETHNIC GROUP AND GENDER

	2010							
ETHNIC GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
Chinese	34	81.0	32	76.2	66	78.6		
Malay	7	16.7	6	14.3	13	15.5		
Indian	1	2.4	2	4.8	3	3.6		
Others	0	0.0	2	4.8	2	2.4		
All Ethnic Groups	42	100	42	100	84	100		

	2011							
ETHNIC GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
Chinese	41	77.4	28	73.7	69	75.8		
Malay	5	9.4	6	15.8	11	12.1		
Indian	6	11.3	4	10.5	10	11.0		
Others	1	1.9	0	0.0	1	1.1		
All Ethnic Groups	53	100	38	100	91	100		

Likewise, in the period 1999 – 2011, among incident transplant patients, the proportion of Chinese was the highest among the different ethnic groups for both genders and was above 60% every year. The proportion of incident transplant patients, by ethnicity, is shown in Figure 9.1.2.1.

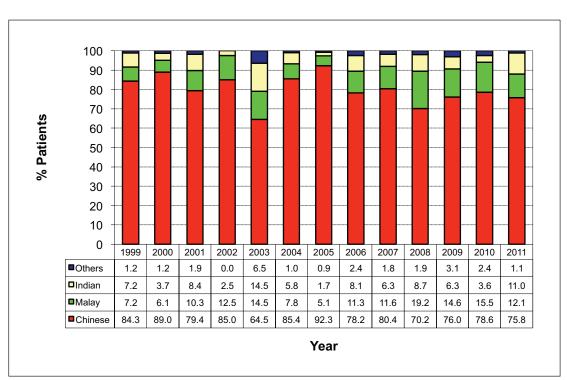


Figure 9.1.2.1: INCIDENT TRANSPLANT PATIENTS BY ETHNIC GROUP, 1999 – 2011

The number of males among incident transplants outnumbered that of females except for years 2002 and 2004. See Table 9.1.2.2.

Table 9.1.2.2: INCIDENT TRANSPLANT PATIENTS BY GENDER, 1999 – 2011

YEAR	Ma	ale	Fem	nale	Both Genders		
IEAR	No	%	No	%	No	%	
1999	44	53.0	39	47.0	83	100.0	
2000	43	52.4	39	47.6	82	100.0	
2001	71	66.4	36	33.6	107	100.0	
2002	37	46.3	43	53.8	80	100.0	
2003	40	64.5	22	35.5	62	100.0	
2004	51	49.5	52	50.5	103	100.0	
2005	67	57.3	50	42.7	117	100.0	
2006	65	52.4	59	47.6	124	100.0	
2007	58	51.8	54	48.2	112	100.0	
2008	60	57.7	44	42.3	104	100.0	
2009	51	53.1	45	46.9	96	100.0	
2010	42	50.0	42	50.0	84	100.0	
2011	53	58.2	38	41.8	91	100.0	

# 9.1.3 Prevalent Transplant Patients by Age Group and Gender

Among prevalent patients, their mean age was 51.7 years (median 53.0 years) in 2010 and 52.3 years (median 53.6 years) in 2011. Expectedly, the mean age for prevalent transplant patients increased from 45.3 years in 1999 to 52.3 years in 2011. See Figure 9.1.3.1.

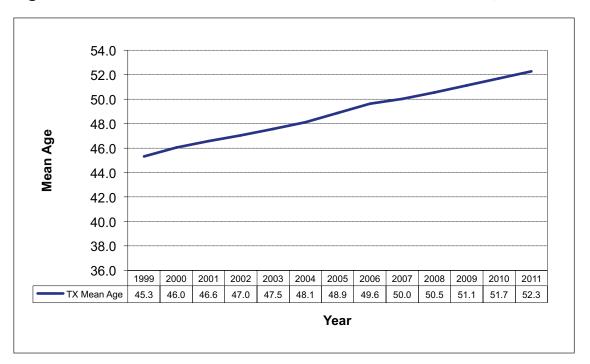


Figure 9.1.3.1: AGE OF PREVALENT TRANSPLANT PATIENTS, 1999 – 2011

Among prevalent patients, 53.9% were males in 2010 and 53.3% in 2011. The age distribution of prevalent transplant patients is shown in Table 9.1.3.1; majority were of the age group 50 to 59 years.

Table 9.1.3.1: PREVALENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER, 2010

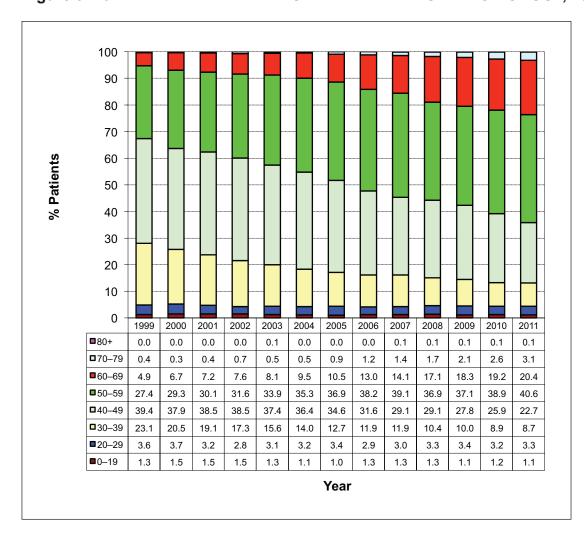
	2010							
AGE GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
0–19	10	1.4	7	1.1	17	1.2		
20–29	17	2.3	26	4.1	43	3.2		
30–39	63	8.6	58	9.2	121	8.9		
40–49	185	25.2	168	26.7	353	25.9		
50–59	276	37.6	255	40.5	531	38.9		
60–69	162	22.0	100	5.9	262	19.2		
70–79	22	3.0	13	2.1	35	2.6		
80+	0	0.0	2	0.3	2	0.1		
All Age Groups	735	100	629	100	1364	100		

Table 9.1.3.1: PREVALENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER, 2011

	2011						
AGE GROUP	Ma	ale	Female		Both Genders		
	No	%	No	%	No	%	
0–19	8	1.1	8	1.2	16	1.1	
20–29	18	2.4	28	4.3	46	3.3	
30–39	65	8.7	57	8.7	122	8.7	
40–49	165	22.1	154	23.5	319	22.7	
50–59	294	39.3	275	42.0	569	40.6	
60–69	169	22.6	117	17.9	286	20.4	
70–79	29	3.9	14	2.1	43	3.1	
80+	0	0.0	2	0.3	2	0.1	
All Age Groups	748	100	655	100	1403	100	

Trends in age groups are shown in Figure 9.1.3.2. Of note is the increasing age of prevalent transplant patients.

Figure 9.1.3.2: PREVALENT TRANSPLANT PATIENTS BY AGE GROUP, 1999 – 2011



## 9.1.4 Prevalent Transplant Patients by Ethnic Group and Gender

Among prevalent transplant patients in 2010 and 2011, the majority were Chinese. See Table 9.1.4.1.

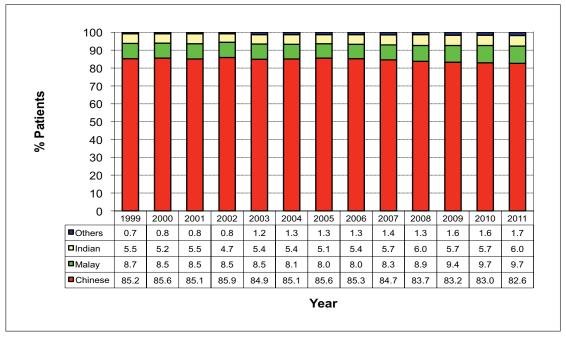
Table 9.1.4.1: PREVALENT TRANSPLANT PATIENTS BY ETHNIC GROUP AND GENDER

	2010							
ETHNIC GROUP	Male		Female		Both Genders			
	No	%	No	%	No	%		
Chinese	609	82.9	523	83.1	1132	83.0		
Malay	67	9.1	65	10.3	132	9.7		
Indian	47	6.4	31	4.9	78	5.7		
Others	12	1.6	10	1.6	22	1.6		
All Ethnic Groups	735	100	629	100	1364	100		

	2011						
ETHNIC GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
Chinese	619	82.8	540	82.4	1159	82.6	
Malay	67	9.0	69	10.5	136	9.7	
Indian	50	6.7	34	5.2	84	6.0	
Others	12	1.6	12	1.8	24	1.7	
All Ethnic Groups	748	100	655	100	1403	100	

Throughout the period 1999 – 2011, Chinese comprised the highest proportion of prevalent transplant patients groups for both genders and were above 80%.

Figure 9.1.4.1: PREVALENT TRANSPLANT PATIENTS BY ETHNIC GROUP, 1999 – 2011



Males comprised 53.4% and 53.3% of prevalent transplant patients in 1999 and 2011 respectively. See Table 9.1.4.2.

Table 9.1.4.2: PREVALENT TRANSPLANT PATIENTS BY GENDER, 1999 – 2011

YEAR	Ma	ale	Female		
TEAR	No	%	No	%	
1999	450	53.4	393	46.6	
2000	479	54.1	407	45.9	
2001	530	55.2	430	44.8	
2002	530	54.5	442	45.5	
2003	551	55.2	447	44.8	
2004	575	54.9	472	45.1	
2005	611	54.9	501	45.1	
2006	647	54.8	534	45.2	
2007	668	54.2	564	45.8	
2008	698	54.7	579	45.3	
2009	719	54.3	606	45.7	
2010	735	53.9	629	46.1	
2011	748	53.3	655	46.7	

# 9.2 Aetiology of Renal Failure among Renal Transplants

Most incident renal transplant patients had glomerulonephritis (64.3% in 2010 and 62.6% in 2011) as the underlying aetiology of renal failure. Patients with underlying diabetic nephropathy among incident transplants were 11.9% in 2010 and 9.9% in 2011. The corresponding figure for hypertension and renovascular disease was 6.0% in 2010 and 8.8% in 2011. See Table 9.2.1.

Likewise, of the prevalent transplant population, the majority (71.3% in 2010 and 71.0 in 2011) had primary glomerulonephritis as the aetiology of renal failure while patients with diabetic nephropathy comprising only 7.3% in 2010 and 2011. The corresponding figure for hypertension and renovascular disease was 5.9% in 2010 and 6.1% in 2011. See Table 9.2.1. This was in sharp contrast to the dialysis population where the vast majority of patients had underlying diabetic nephropathy as the aetiology of renal failure. See Tables 9.2.1 and 9.2.2. Among incident transplant patients, the proportion of diabetic nephropathy as aetiology of renal failure increased from 4.8% in 1999 to 9.9% in 2011. Similarly, an increasing proportion of diabetic nephropathy as aetiology of renal failure was observed among prevalent transplant patients. See Figures 9.2.1 and 9.2.2.

Table 9.2.1: AETIOLOGY OF RENAL FAILURE AMONG INCIDENT AND PREVALENT TRANSPLANT PATIENTS

		20	10		2011			
AETIOLOGY OF RENAL FAILURE	Inci	dent	Prevalent		Incident		Prevalent	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	10	11.9	99	7.3	9	9.9	102	7.3
Primary Glomerulonephritis (GN)	254	64.3	972	71.3	57	62.6	996	71.0
Autoimmune Disease/GN with Systemic Manifestations	4	4.8	56	4.1	4	4.4	60	4.3
Hypertension and Renovascular Disease	5	6.0	80	5.9	8	8.8	86	6.1
Polycystic Kidney Disease/Other Cystic Diseases	6	7.1	57	4.2	4	4.4	56	4.0
Vesicoureteric Reflux/Chronic Pyelonephritis	2	2.4	20	1.5	1	1.1	21	1.5
Obstruction	1	1.2	4	0.3	0	0.0	4	0.3
Stone Disease	0	0.0	3	0.2	0	0.0	3	0.2
Miscellaneous	1	1.2	33	2.4	8	8.8	38	2.7
Unknown	1	1.2	40	2.9	0	0.0	37	2.6
All Aetiology	84	100	1364	100	91	100	1403	100

Figure 9.2.1: DIABETIC NEPHROPATHY, GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE AS AETIOLOGY OF RENAL FAILURE AMONG INCIDENT TRANSPLANT PATIENTS, 1999 – 2011

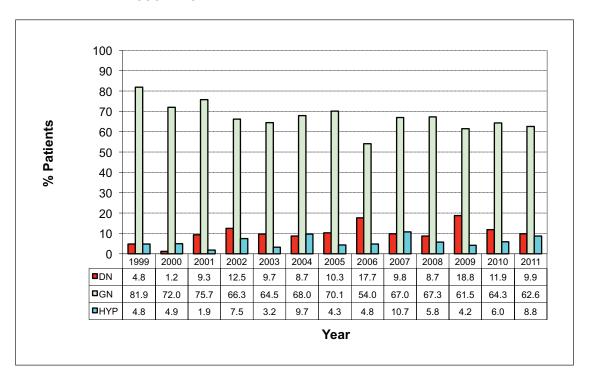
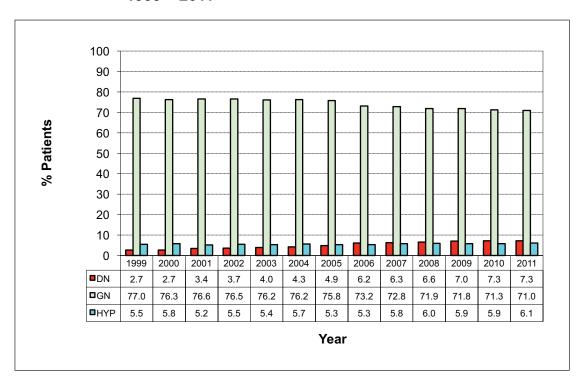


Figure 9.2.2: DIABETIC NEPHROPATHY, GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE AS AETIOLOGY OF RENAL FAILURE AMONG PREVALENT TRANSPLANT PATIENTS, 1999 – 2011



#### 9.3 Co-morbid Conditions

Diabetes Mellitus was reported in 20.2% of newly transplanted patients in 2010 and 20.9% in 2011. See Table 9.3.1 and Figure 9.3.1.

Ischaemic Heart Disease was reported in 15.5% of patients in 2010 and 16.5% in 2011, Cerebrovascular Disease was 3.6% in 2010 and 4.4% in 2011, Peripheral Vascular Disease was 1.2% in 2010 and 3.3% in 2011.

There were 8.3% of patients who were current smokers in 2010 and 8.8% in 2011. Former smokers were 14.3% in 2010 and 12.1% in 2011.

In 2010, there were 2.4% of incident transplant patients who were serologically positive for Hepatitis B Surface Antigen while 2.2% were positive in 2011. Only 2.2% of incident transplant patients were Anti-HCV positive in 2011. A small proportion of patients had unknown Hepatitis B Surface Antigen status and Anti-HCV status.

An increase in the proportion of incident patients with co-morbidities was observed over the period from 1999 – 2011. See Figure 9.3.1.

Table 9.3.1: CO-MORBID CONDITIONS AMONG INCIDENT TRANSPLANT PATIENTS

<b>No</b> 17	<b>%</b> 20.2	<b>No</b> 19	%		
17		10			
		19	20.9		
67	79.8	72	79.1		
			0.0		
84	100	91	100		
2	010	2011			
			%		
13		15	16.5		
			83.5		
		0	0.0		
		91	100		
-		-			
2	010	20	)11		
No	%	No	%		
3	3.6	4	4.4		
81	96.4	87	95.6		
0	0.0	0	0.0		
84	100	91	100		
2	010	20	)11		
No	%	No	%		
1	1.2	3	3.3		
83	98.8	88	96.7		
0	0.0	0	0.0		
84	100	91	100		
2	010	2011			
No	%	No	%		
7	8.3	8	8.8		
12	14.3	11	12.1		
63	75.0	69	75.8		
2	2.4	3	3.3		
84		91	100		
2	010	20	)11		
No	%	No	%		
2	2.4	2	2.2		
78	92.9	88	96.7		
4	4.8	1	1.1		
		91	100		
2	010	20	)11		
No -	%	No	%		
		2	2.2		
0	()()	,			
78	0.0				
0 78 6	92.9 7.1	88 1	96.7 1.1		
	No 13 71 0 84  No 3 81 0 84  No 1 83 0 84  No 7 12 63 2 84  No 2 7 12 63 2 84  No 2	2010       No     %       13     15.5       71     84.5       0     0.0       84     100       No     %       3     3.6       81     96.4       0     0.0       84     100       No     %       1     1.2       83     98.8       0     0.0       84     100       No     %       7     8.3       12     14.3       63     75.0       2     2.4       84     100       No     %       2     2.4       78     92.9       4     4.8       84     100	84         100         91           No         %         No           13         15.5         15           71         84.5         76           0         0.0         0           84         100         91           2010         20           No         %         No           3         3.6         4           81         96.4         87           0         0.0         0           84         100         91           2010         20         0           No         %         No           1         1.2         3           83         98.8         88           0         0.0         0           84         100         91           2010         20         20           No         %         No           7         8.3         8           12         14.3         11           63         75.0         69           2         2.4         3           84         100         91           2010         20		

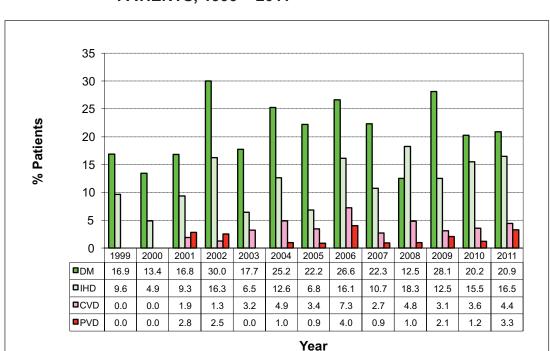


Figure 9.3.1: CO-MORBID CONDITIONS AMONG INCIDENT TRANSPLANT PATIENTS, 1999 – 2011

The list of co-morbidities affecting prevalent transplant patients is shown in Table 9.3.2. About one quarter (26.1% in 2010 and 25.3% in 2011) had diabetes mellitus. The higher incidence of diabetes as co-morbidity among prevalent transplant patients may be related to immunosuppressive therapy used post-transplant as only a small proportion had underlying diabetic nephropathy. Other co-morbidities included ischaemic heart disease, cerebrovascular disease, peripheral vascular disease, currently smoking, Hepatitis B surface antigen positivity and Anti-HCV positivity. Expectedly, the proportion of prevalent transplant patients with co-morbidities increased over the evaluation period. See Table 9.3.2 and Figure 9.3.2. The proportion of prevalent transplant patients with these co-morbidities was lower than that of for prevalent dialysis patients. See Tables 8.5.2.1 and 9.3.2.

Table 9.3.2: CO-MORBID CONDITIONS AMONG PREVALENT TRANSPLANT PATIENTS

	20	10	20	11		
Diabetic Mellitus	No	%	No	%		
Yes	356	26.1	355	25.3		
No	1008	73.9	1048	74.7		
Unknown	0	0.0	0	0.0		
Total	1364	100	1403	100		
Ischaemic Heart Disease	20		20			
loondonno modre bioodoo	No	%	No	%		
Yes	210	15.4	216	15.4		
No	1154	84.6	1187	84.6		
Unknown	0	0.0	0	0.0		
Total	1364	100	1403	100		
Cerebrovascular Disease	20		20			
	No	%	No	%		
Yes	62	4.5	66	4.7		
No	1302	95.5	1337	95.3		
Unknown	0	0.0	0	0.0		
Total	1364	100	1403	100		
	22	4.0		4.4		
Peripheral Vascular Disease	20		20			
Van	No	%	No	%		
Yes	25	1.8	27	1.9		
No	1339	98.2	1376	98.1		
Unknown	0 <b>1364</b>	0.0 <b>100</b>	0 <b>1403</b>	0.0		
Total	1364 100		1403	100		
	20	10	2011			
Smoking	No	%	No	%		
Current Smoker	46	3.4	49	3.5		
Ex-Smoker	196	14.4	196	14.0		
Non-Smoker/Never	1099	80.6	1132	80.7		
Unknown	23	1.7	26	1.9		
Total	1364	100	1403	100		
. Ottal	1007	100	1700	100		
	20	10	20	11		
Hepatitis B S Ag Status	No	%	No	%		
Positive	44	3.2	49	3.5		
Negative	1303	95.5	1342	95.7		
Unknown	17	1.2	12	0.9		
Total	1364	100	1403	100		
A 41 1101/ 04-4	20	10	20	11		
Anti-HCV Status	No	%	No	%		
Positive	63	4.6	62	4.4		
Negative	1265	92.7	1312	93.5		
Unknown	36	2.6	29	2.1		
Total	1364	100	1403	100		

30 25 20 % Patients 15 10 5 0 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 ■ DM 23.5 23.4 24.0 24.4 24.4 25.5 25.7 26.6 26.5 26.3 □IHD 10.0 10.0 13.7 14.7 15.6 11.0 12.0 12.2 12.9 14.1 15.2 15.4 15.4 ■ CVD 2.8 2.7 2.6 2.5 2.7 2.9 3.1 3.9 4.1 4.4 4.2 4.5 4.7 ■ PVD 8.0 0.9 1.1 1.1 1.0 1.4 1.6 1.6 1.7 1.7 1.8 1.9 Year

Figure 9.3.2: CO-MORBID CONDITIONS AMONG PREVALENT TRANSPLANT PATIENTS, 1999 – 2011

# 9.4 Location where Transplant was Performed

# 9.4.1 Incident Transplant Patients

Among incident patients, the majority was performed locally, primarily at the Singapore General Hospital (34.5% in 2010 and 42.8% in 2011). However, about 27% of the transplants were performed at overseas centres in 2010 and 2011. See Figure 9.4.1.1.

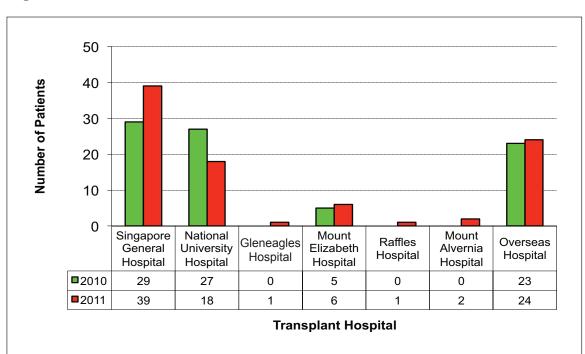


Figure 9.4.1.1: INCIDENT TRANSPLANTS BY TRANSPLANT HOSPITAL

The proportion of incident transplants that were performed at Singapore General Hospital and overseas hospitals decreased in 2009 then increased in 2011 whereas the reverse was noted for transplants from the National University Hospital. The twelve-year-trend is seen in Figure 9.4.1.2.

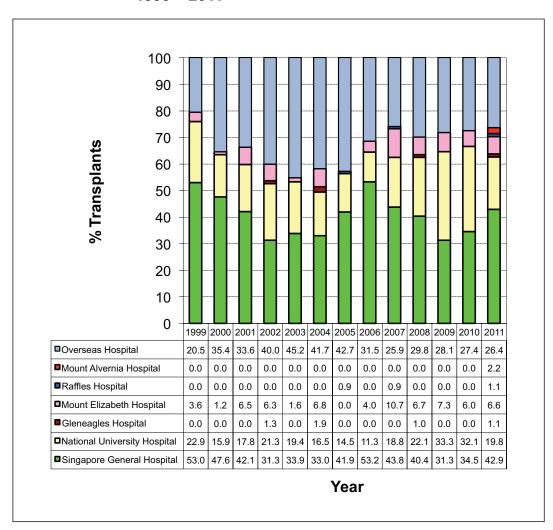


Figure 9.4.1.2: INCIDENT TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2011

# 9.4.2 Prevalent Transplant Patients

Among the prevalent transplant population, the majority had been performed at the Singapore General Hospital (49.0% in 2010 and 48.7% in 2011). See Figure 9.4.2.1.

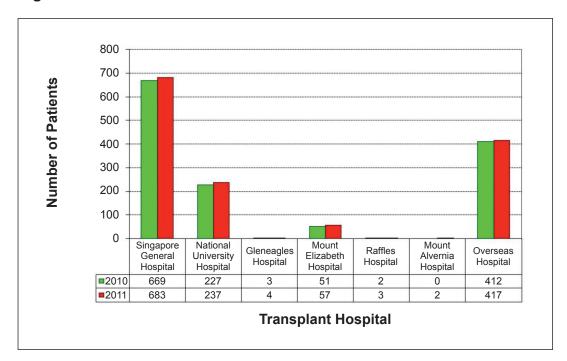
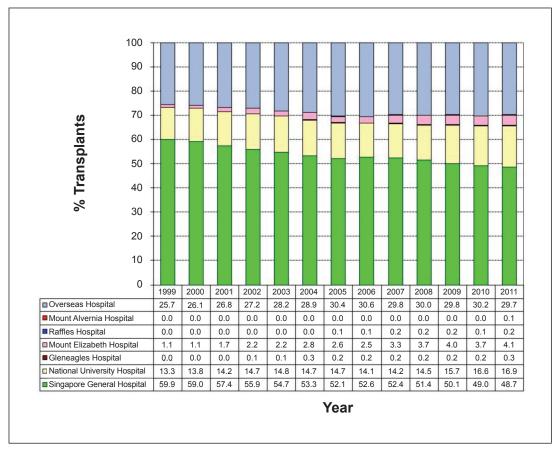


Figure 9.4.2.1: PREVALENT TRANSPLANTS BY TRANSPLANT HOSPITAL

For the period 1999 to 2011, the majority of transplants had been performed at the Singapore General Hospital among the prevalent transplant patients. See Figure 9.4.2.2.

Figure 9.4.2.2: PREVALENT TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2011



# 9.5 Donor Type and Source

Among incident patients transplanted locally, 54 (64.3%) in 2010 had received deceased-donor renal transplants. At the end of year 2010, 909 of 1364 prevalent patients (66.6%) had received deceased-donor transplants. See Tables 9.5.1 and 9.5.3.

Among incident patients transplanted locally, 51 (56.0%) in 2011 had received deceased-donor renal transplants. At the end of year 2011, 922 of 1403 prevalent patients (65.7%) had received deceased-donor transplants. See Tables 9.5.1 and 9.5.3.

Table 9.5.1: INCIDENT TRANSPLANTS BY DONOR TYPE AND TRANSPLANT HOSPITAL

	2010									
HOSPITAL	Living	-Donor	Decease	d-Donor	All Donors					
	No	%	No	%	No	%				
Singapore General Hospital	6	20.0	23	42.6	29	34.5				
National University Hospital	14	46.7	13	24.1	27	32.1				
Mount Elizabeth Hospital	5	16.7	0	0.0	5	6.0				
Overseas Hospital	5	16.7	18	33.3	23	27.4				
All Transplant Hospitals	30	100	54	100	84	100				

			20	11			
HOSPITAL	Living-Donor		Decease	d-Donor	All Donors		
	No	%	No	%	No	%	
Singapore General Hospital	13	32.5	26	51.0	39	42.9	
National University Hospital	8	20.0	10	19.6	18	19.8	
Gleneagles Hospital	1	2.5	0	0.0	1	1.1	
Mount Elizabeth Hospital	6	15.0	0	0.0	6	6.6	
Raffles Hospital	1	2.5	0	0.0	1	1.1	
Mount Alvernia Hospital	2	5.0	0	0.0	2	2.2	
Overseas Hospital	9	22.5	15	29.4	24	26.4	
All Transplant Hospitals	40	100	51	100	91	100	

<sup>&</sup>lt;sup>†</sup> There were 2 transplants whereby the donor type could not be ascertained, and hence excluded in the count.

Majority of the incident living-donor transplant were performed at Singapore General Hospital and National University Hospital in the twelve-year period. See Figure 9.5.1.

100 90 80 70 60 50 40 30 20 10 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 Overseas Hospital 20.0 10.0 16.7 5.3 23.8 9.7 11.1 14.7 14.0 18.2 22.2 16.7 22.5 0.0 0.0 Mount Alvernia Hospital 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ■ Raffles Hospital 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ■ Mount Elizabeth Hospital 20.0 10.0 23.3 26.3 4.8 22.6 0.0 14.7 27.9 19.4 16.7 15.0 ■ Gleneagles Hospital 0.0 0.0 0.0 5.3 0.0 6.5 0.0 0.0 0.0 3.0 0.0 0.0 2.5 □ National University Hospital 20.0 40.0 23.3 42.1 38 1 38.7 37.0 20.6 25.6 30.3 41 7 46.7 20.0 ■ Singapore General Hospital 40.0 | 40.0 | 36.7 | 21.1 | 33.3 | 22.6 | 48.1 | 50.0 | 30.2 | 27.3 | 16.7 | 20.0 | 32.5 Year

Figure 9.5.1: INCIDENT LIVING-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2011

Among incident deceased-donor transplants, the numbers performed at overseas hospitals increased for the period 1999-2003 then started to decline thereafter. See Figure 9.5.2.

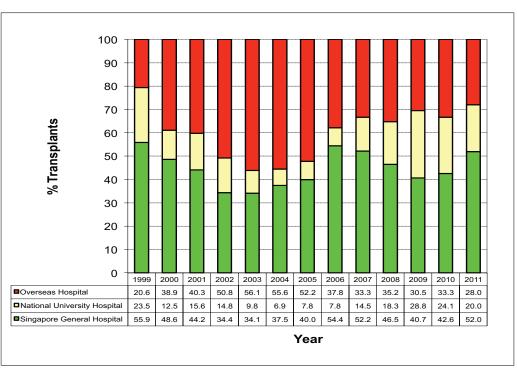


Figure 9.5.2: INCIDENT DECEASED-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2011

Among incident living-donor transplants, the majority was biologically related (40.0% in 2010; 52.5% in 2011). See Table 9.5.2.

Table 9.5.2: INCIDENT LIVING-DONOR TRANSPLANTS BY DONOR RELATIONSHIP AND TRANSPLANT HOSPITAL

	2010										
HOSPITAL	Biologica	Biologically Related		Emotionally Related			All Living Donors				
	No	%	No	%	No	%	No	%			
Singapore General Hospital	3	25.0	3	18.8	0	0.0	6	20.0			
National University Hospital	8	66.7	6	37.5	0	0.0	14	46.7			
Mount Elizabeth Hospital	1	8.3	4	25.0	0	0.0	5	16.7			
Overseas Hospital	0	0.0	3	18.8	2	100.0	5	16.7			
All Transplant Hospitals	12	100	16	100	2	100	30	100			

				2011				
HOSPITAL	Biological	lly Related	Emotional	<b>Emotionally Related</b>			All Living Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	7	33.3	5	41.7	1	14.3	13	32.5
National University Hospital	4	19.0	4	33.3	0	0.0	8	20.0
Gleneagles Hospital	1	4.8	0	0.0	0	0.0	1	2.5
Mount Elizabeth Hospital	4	19.0	2	16.7	0	0.0	6	15.0
Raffles Hospital	0	0.0	1	8.3	0	0.0	1	2.5
Mount Alvernia Hospital	2	9.5	0	0.0	0	0.0	2	5.0
Overseas Hospital	0	0.0	3	18.8	2	100.0	5	16.7
All Transplant Hospitals	21	100	12	100	7	100	40	100

Among prevalent patients, the majority of the transplants had been performed at the Singapore General Hospital (669 in 2010 and 683 in 2011). Of note, approximately one third of prevalent patients (412 in 2010 and 417 in 2011) have received renal transplantation at overseas hospitals. See Table 9.5.3.

Table 9.5.3: PREVALENT TRANSPLANTS BY DONOR TYPE AND TRANSPLANT HOSPITAL

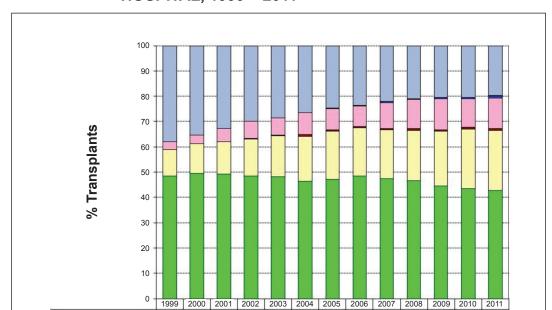
			20	10			
HOSPITAL	Living	-Donor	Decease	d-Donor	All Donors		
	No	%	No	%	No	%	
Singapore General Hospital	197	43.5	472	51.9	669	49.0	
National University Hospital	107	23.6	120	13.2	227	16.6	
Gleneagles Hospital	3	0.7	0	0.0	3	0.2	
Mount Elizabeth Hospital	51	11.3	0	0.0	51	3.7	
Raffles Hospital	2	0.4	0	0.0	2	0.1	
Overseas Hospital	93	20.5	317	34.9	412	30.2	
All Transplant Hospitals	453	100	909	100	1364	100	

Note: 2 overseas cases with missing donor status

			20	11			
HOSPITAL	Living	-Donor	Decease	d-Donor	All Donors		
	No	%	No	%	No	%	
Singapore General Hospital	204	42.7	479	52.0	683	48.7	
National University Hospital	114	23.8	123	13.3	237	16.9	
Gleneagles Hospital	4	0.8	0	0.0	4	0.3	
Mount Elizabeth Hospital	57	11.9	0	0.0	57	4.1	
Raffles Hospital	3	0.6	0	0.0	3	0.2	
Mount Alvernia Hospital	2	0.4	0	0.0	2	0.1	
Overseas Hospital	94	19.7	320	34.7	417	29.7	
All Transplant Hospitals	478	100	922	100	1403	100	

Note: 3 overseas cases with missing donor status

Majority of the living and deceased-donor prevalent transplants had undergone transplantation at the Singapore General Hospital for the period 1999 to 2011. Of the prevalent living-donor transplants, 19.7% of them sought transplants overseas in 2011. Although there had been no significant trends in numbers of incident living-donor transplants from overseas hospitals (See Figure 9.5.1), there was a definite trend to decreasing numbers of prevalent living-donor transplants from overseas hospitals in the evaluation period suggesting reduced survival in the latter. See Figure 9.5.3. In contrast, an increasingly larger proportion of prevalent decreased-donor transplants were from overseas hospitals. See Figure 9.5.4.



28.6 26.4

0.0 0.0

0.0 0.0 0.3

6.8 8.6 8.3

48.1

17.8

46.3 47.1

Overseas Hospital

Raffles Hospital

Mount Alvernia Hospital

■Mount Elizabeth Hospital

□ National University Hospital

Singapore General Hospital

■ Gleneagles Hospital

38.0 35.4 32.7 29.9

0.0 0.0 0.0 0.0

0.0

3.0

10.4 11.7

48.5

0.0

3.4 5.2 6.8

49.5 49.2

0.0

12.9

0.0

14.6 16.1

48.4

Figure 9.5.3: PREVALENT LIVING-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 - 2011

Figure 9.5.4: PREVALENT DECEASED-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 - 2011

24.6

0.0

19.1

Year

23.6

0.0

0.3

8.2

19.0

48.4

22.0

0.0

0.5

10.4 11.4

0.5

19.2

47.5 46.6

20.9

0.0

0.5

19.9

20.6 20.5

0.0 0.0 0.4

0.5 0.4

12.1

21.5 23.6

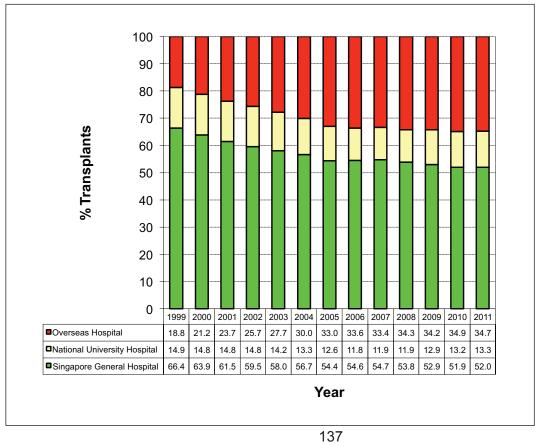
44.6 43.5 42.7

11.3 11.9

19.7

0.6

23.8



While living-related transplants, either biologically-related or emotionally-related, were performed at local hospitals, the majority of unrelated (i.e. neither biologically nor emotionally related) living-donor transplants had been performed at overseas hospitals. See Table 9.5.4.

Table 9.5.4: PREVALENT LIVING-DONOR TRANSPLANTS BY DONOR SOURCE AND TRANSPLANT HOSPITAL

				2010				
HOSPITAL	Biologically Related		Emotional	Neither		All Living Donors		
	No	%	No	%	No	%	No	%
Singapore General Hospital	156	57.8	41	37.6	0	0.0	197	43.5
National University Hospital	70	25.9	37	33.9	0	0.0	107	23.6
Gleneagles Hospital	2	0.7	1	0.9	0	0.0	3	0.7
Mount Elizabeth Hospital	25	9.3	23	21.1	3	4.1	51	11.3
Raffles Hospital	1	0.4	1	0.9	0	0.0	2	0.4
Overseas Hospital	16	5.9	6	5.5	71	95.9	93	20.5
All Transplant Hospitals	270	100	109	100	74	100	453	100

				2011				
HOSPITAL	Biological	lly Related	Emotional	Neither		All Living Donors		
	No	%	No	%	No	%	No	%
Singapore General Hospital	157	55.3	46	38.0	1	1.4	204	42.7
National University Hospital	74	26.1	40	33.1	0	0.0	114	23.8
Gleneagles Hospital	3	1.1	1	8.0	0	0.0	4	0.8
Mount Elizabeth Hospital	29	10.2	25	20.7	3	4.1	57	11.9
Raffles Hospital	1	0.4	2	1.7	0	0.0	3	0.6
Mount Alvernia Hospital	2	0.7	0	0.0	0	0.0	2	0.4
Overseas Hospital	18	6.3	7	5.8	69	94.5	94	19.7
All Transplant Hospitals	284	100	121	100	73	100	478	100

#### 9.6 Graft and Patient Outcomes

#### 9.6.1 Demographics for Transplant Deaths

There were 18 deaths amongst transplant patients in 2010 and 20 deaths in 2011. See Table 9.6.1.1. The death rate, defined as the proportion of transplant deaths among all those with a functioning graft for a particular year, was 3.2% in 2010 and 3.0% in 2011. Mortality among renal transplants was lower than that for dialysis patients. See Table 8.9.1.1.

Majority of the deaths amongst transplant patients occurred in the age group 60 to 69 years for both genders. See Table 9.6.1.1.

Table 9.6.1.1: TRANSPLANT DEATHS BY AGE GROUP AND GENDER

			20	10			
AGE GROUP	Ma	ale	Fen	nale	Both Genders		
	No	%	No	%	No	%	
0–19	0	0.0	0	0.0	0	0.0	
20–29	0	0.0	0	0.0	0	0.0	
30–39	0	0.0	0	0.0	0	0.0	
40–49	1	8.3	2	33.3	3	16.7	
50–59	4	33.3	0	0.0	4	22.2	
60–69	5	41.7	2	33.3	7	38.9	
70–79	2	16.7	2	33.3	4	22.2	
80+	0	0.0	0	0.0	0	0.0	
All Age Groups	12	100	6	100	18	100	

	2011						
AGE GROUP	Male		Female		Both Genders		
	No	%	No	%	No	%	
0–19	0	0.0	0	0.0	0	0.0	
20–29	0	0.0	0	0.0	0	0.0	
30–39	0	0.0	1	50.0	1	5.0	
40–49	2	11.1	0	0.0	2	10.0	
50–59	2	11.1	1	50.0	3	15.0	
60–69	13	72.2	0	0.0	13	65.0	
70–79	1	5.6	0	0.0	1	5.0	
80+	0	0.0	0	0.0	0	0.0	
All Age Groups	18	100	2	100	20	100	

The mean age at death for transplant patients was 61.7 years in 2010 and 61.2 in 2011.

The deaths in different ethnic groups for transplant patients are shown in Table 9.6.1.2.

Table 9.6.1.2: TRANSPLANT DEATHS BY ETHNIC GROUP AND GENDER, 2010

	2010						
	Ma	ale	Fen	Female		Both Genders	
	No	%	No	%	No	%	
Chinese	12	100.0	4	66.7	16	88.9	
Malay	0	0.0	1	16.7	1	5.6	
Indian	0	0.0	1	16.7	1	5.6	
Others	0	0.0	0	0.0	0	0.0	
All Ethnic Groups	12	100	6	100	18	100	

Table 9.6.1.2: TRANSPLANT DEATHS BY ETHNIC GROUP AND GENDER, 2011

	2011						
	Male		Fen	Female		Both Genders	
	No	%	No	%	No	%	
Chinese	15	83.3	1	50.0	16	80.0	
Malay	1	5.6	0	0.0	1	5.0	
Indian	2	11.1	1	50.0	3	15.0	
Others	0	0.0	0	0.0	0	0.0	
All Ethnic Groups	18	100	2	100	20	100	

#### 9.6.2 Causes of Death

Infection accounted for 55.6% of deaths in 2010 and 25.0% in 2011, while cardiac events (AMI and other cardiac causes) accounted for 11.1% of deaths in 2010 and 35.0% in 2011. See Table 9.6.2.1.

Table 9.6.2.1: CAUSES OF DEATH IN TRANSPLANT PATIENTS

Cause of Death	20	10	2011	
Cause of Death	No	%	No	%
Acute Myocardial Infarct (AMI)	2	11.1	4	20.0
Other Cardiac	0	0.0	3	15.0
Cerebrovascular Accident (CVA)	2	11.1	1	5.0
Infections	10	55.6	5	25.0
Liver Failure	0	0.0	0	0.0
Other Haemorrhage	0	0.0	1	5.0
Malignancy	3	16.7	4	20.0
Withdraw dialysis	0	0.0	0	0.0
Uremia	1	5.6	2	10.0
Total	18	100	20	100

#### 9.6.3 Causes of Graft Failure

There were 23 graft failures among the transplant patients in 2010 and 34 in 2011. The greatest proportion of graft failure was due to chronic rejection (69.6% in 2010; 58.8% in 2011), followed by chronic allograft nephropathy (17.4% in 2010; 20.6% in 2011). See Table 9.6.3.1.

Table 9.6.3.1: CAUSES OF GRAFT FAILURE IN TRANSPLANT PATIENTS

	2010		2011	
	No	%	No	%
Chronic Rejection	16	69.6	20	58.8
Recurrent disease	0	0.0	1	2.9
Acute rejection	1	4.3	5	14.7
Graft thrombosis	0	0.0	1	2.9
Chronic allograft nephropathy	4	17.4	7	20.6
Infection	2	8.7	0	0.0
All Causes of Graft Failure	23	100	34	100

# 9.6.4 Survival Analysis

The chances of surviving 1 year and 5 years with a functioning graft for transplanted patients were 97.7% and 92.5% respectively. The corresponding 1 and 5-year graft survivals were 95.0% and 89.8% respectively. See Table 9.6.4.1.

**Table 9.6.4.1: GRAFT AND PATIENT SURVIVAL, 1999 – 2011** 

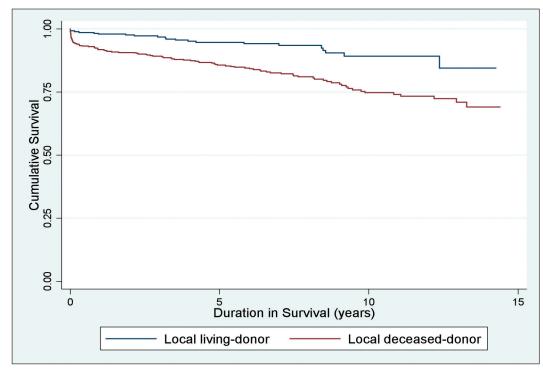
YEAR OF TRANSPLANT	SURVIVAL				
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Graft	95.0	93.6 – 96.1	89.8	87.9 – 91.4	
Patient	97.7	96.7 – 98.4	92.5	90.8 - 93.9	

Graft and patient survival of renal transplants for living vs. deceased-donor transplants are shown in Table 9.6.4.2 and Figure 9.6.4.1; local living-donor transplants generally had better graft and patient survival than local deceased-donor transplants.

Table 9.6.4.2: GRAFT AND PATIENT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2011

YEAR OF TRANSPLANT	SURVIVAL				
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Graft					
Local living-donor	97.6	94.6 – 98.9	94.7	90.9 – 97.0	
Local deceased-donor	91.1	88.0 – 93.4	85.2	81.4 – 88.3	
Patient					
Local living-donor	98.0	95.6 – 99.1	94.8	91.3 – 96.9	
Local deceased-donor	91.9	89.2 – 93.9	85.7	82.2 – 88.5	

Figure 9.6.4.1: GRAFT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2011



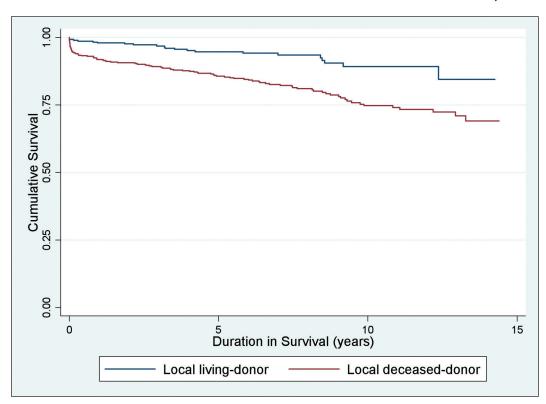


Figure 9.6.4.2: PATIENT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2011

In a separate analysis, survival for locally performed transplants was compared with that for overseas transplants. As patients who had undergone transplant overseas but had lost their transplants or died at the overseas transplant centres would not have been registered as transplants in the Registry database, only transplants functioning beyond 30 days were included and deaths or graft losses before 30 days were censored from the analysis. See Table 9.6.4.3; Figure 9.6.4.3 and Figure 9.6.4.4. Local living-donor transplants had the best graft survival probability as compared to overseas living-donor, local deceased-donor or overseas deceased-donor transplants.

Table 9.6.4.3: CENSORED GRAFT AND PATIENT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2011

YEAR OF TRANSPLANT	SURVIVAL				
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Graft					
Local living-donor	98.8	96.7 – 99.5	95.6	92.4 – 97.5	
Overseas living-donor	98.4	89.3 – 99.8	90.2	77.6 – 95.9	
Local deceased-donor	96.5	94.5 – 97.8	90.0	86.8 – 92.4	
Overseas deceased-donor	98.8	96.9 – 99.6	94.0	90.7 – 96.1	
Patient					
Local living-donor	98.8	96.7 – 99.6	95.6	92.4 – 97.5	
Overseas living-donor	100	_	95.7	83.2 – 98.9	
Local deceased-donor	97.7	95.9 – 98.7	91.3	88.3 – 93.6	
Overseas deceased-donor	98.8	96.9 – 99.6	94.0	90.7 – 96.1	



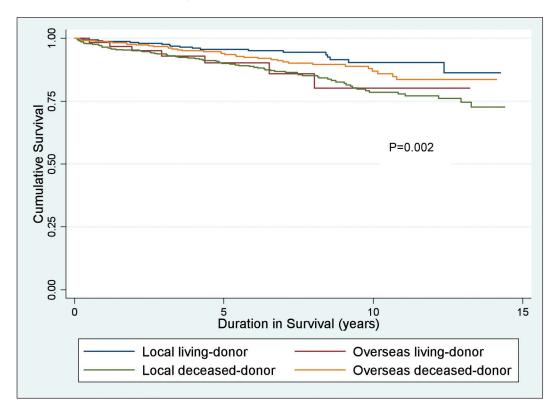
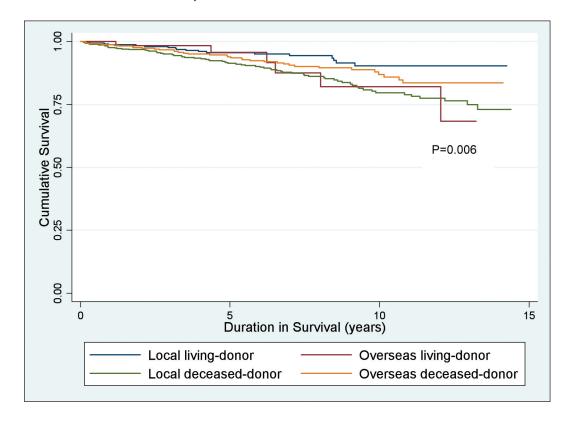


Figure 9.6.4.4: CENSORED PATIENT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2011



Although graft and patient survival was comparable at 1 year, patient survival was poorer at 5 years for patients with diabetic nephropathy. See Table 9.6.4.5.

Table 9.6.4.5: GRAFT AND PATIENT SURVIVAL BY AETIOLOGY OF RENAL FAILURE AMONG RENAL TRANSPLANTS, 1999 – 2011

YEAR OF TRANSPLANT	GRAFT SURVIVAL				
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Diabetic Nephropathy	97.6	92.8 - 99.2	83.0	74.2 – 89.0	
Non-diabetic Nephropathy	94.7	93.2 – 95.9	90.5	88.5 – 92.2	

P=0.06

YEAR OF TRANSPLANT	PATIENT SURVIVAL				
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Diabetic Nephropathy	97.6	92.8 – 99.2	83.0	74.2 – 89.0	
Non-diabetic Nephropathy	97.7	96.6 – 98.4	93.6	91.8 – 94.9	

P=0.003

There were no significant differences in graft and patient survivals between genders. Chinese had the best graft and patient survivals among the three ethnic groups. See Tables 9.6.4.6 and 9.6.4.7. As expected, patients aged below 60 years had significantly better graft and patient survival than those over age 60. See Table 9.6.4.8.

Table 9.6.4.6: GRAFT AND PATIENT SURVIVAL BY GENDER, 1999 – 2011

YEAR OF TRANSPLANT	GRAFT SURVIVAL				
1999–2009	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Males	95.0	93.0 – 96.4	90.1	87.4 – 92.2	
Females	95.1	92.9 – 96.6	89.5	86.4 – 91.9	

P=0.11

YEAR OF TRANSPLANT	PATIENT SURVIVAL				
1999–2009	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Males	97.6	96.1 – 98.5	92.8	90.5 – 94.6	
Females	97.8	96.2 – 98.7	92.2	89.3 – 94.2	

P=0.11

Table 9.6.4.7: GRAFT AND PATIENT SURVIVAL BY ETHNIC GROUP, 1999 - 2011

YEAR OF TRANSPLANT	GRAFT SURVIVAL			
1999–2009	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.
Chinese	95.8	94.4 – 96.9	91.0	88.9 – 92.7
Malay	90.5	84.2 – 94.4	85.4	78.0 – 90.5
Indian	92.7	84.4 – 96.6	82.6	71.9 – 89.6

P=0.29

YEAR OF TRANSPLANT	PATIENT SURVIVAL			
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.
Chinese	97.7	96.6 – 98.5	92.9	91.0 – 94.4
Malay	97.1	92.4 – 98.9	92.0	85.6 – 95.7
Indian	97.6	90.6 - 99.4	89.0	79.1 – 94.4

P=0.94

Table 9.6.4.8: GRAFT AND PATIENT SURVIVAL BY AGE GROUP, 1999 – 2011

YEAR OF TRANSPLANT	GRAFT SURVIVAL			
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.
< 60	95.0	93.6 – 96.2	90.2	88.2 – 91.8
≥ 60	94.9	86.9 - 98.0	83.6	72.1 – 90.7

P=0.01

YEAR OF TRANSPLANT	PATIENT SURVIVAL			
1999–2011	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.
< 60	97.9	96.8 - 98.6	93.1	91.3 – 94.5
≥ 60	94.9	86.9 – 98.0	83.6	72.1 – 90.7

P=0.001