MINISTRY OF HEALTH
SINGAPORE

SINGAPORE RENAL REGISTRY REPORT NO. 10

TRENDS IN CHRONIC KIDNEY FAILURE STAGE 5 IN SINGAPORE 2012 / 2013

EDITED BY
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NATIONAL REGISTRY OF DISEASES OFFICE

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Suggested Source Citation

Singapore Renal Registry
National Registry of Diseases Office
Ministry of Health, Singapore

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.

Assoc Prof Evan Lee
Chairman
Singapore Renal Registry

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MINISTRY OF HEALTH

We will like to acknowledge the Ministry of Health and Dr Lim Boon Tar Raymond for kindly vetting the report.

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GLOSSARY

APD	Automated Peritoneal Dialysis
ASR	Age-standardised rate
BSA	Body Surface Area
CAPD	Continuous Ambulatory Peritoneal Dialysis
CKD5	Chronic Kidney Disease Stage 5
CR	Crude Rate
CVD	Cerebrovascular Disease
DM	Diabetes Mellitus
DN	Diabetic Nephropathy
DOS	Department of Statistics
eGFR	Estimated Glomerular Filtration Rate
EPO	Epoetin
ESA	Erythropoiesis Stimulating Agents
GN	Glomerulonephritis
Hb	Haemoglobin
HBsAg	Hepatitis B Surface Antigen
HCV	Hepatitis C Virus
HD	Haemodialysis
IHD	Ischaemic Heart Disease
IV	Intravenous
No	Number
PAHs	Public Acute Hospitals
PD	Peritoneal Dialysis
PMP	Per million resident population
PTE	Private Dialysis Centres
PVD	Peripheral Vascular Disease
RRT	Renal Replacement Therapy
SC	Subcutaneous
TSAT	Transferrin Saturation
TX	Transplant
VWOs	Voluntary Welfare Organisations

1 LIST OF PARTICIPATING CENTRES AND PREVALENT PATIENTS as of 31 DECEMBER 2012 and 2013

Public Acute Hospitals and Affiliated Dialysis Centres	2012			2013		
	HD	PD	TX^	HD	PD	TX^
Singapore General Hospital	10	307	825	8	310	831
Alexandra Hospital	0	15	0	0	23	0
Tan Tock Seng Renal Centre	3	77	15	0	91	17
Changi General Hospital	3	21	0	1	31	0
Khoo Teck Puat Hospital	0	31	0	0	45	0
National University Hospital	5	108	388	5	116	399
NUH Dialysis Centre	71	0	0	61	0	0
Nuh Renal Centre	12	0	0	9	0	0
SHAW NKF - NUH Children's Kidney Centre	4	23	37	2	22	40
Sub-total	**108**	**582**	**1265**	**86**	**638**	**1287**
Voluntary Welfare Organisations	**HD**	**PD**	**TX**	**HD**	**PD**	**TX**
Hong Leong - NKF Dialysis Centre (Aljunied Crescent)	102	0	0	104	0	0
IFPAS - NKF Dialysis Centre (Serangoon)	99	0	0	97	0	0
Japan Airline - NKF Dialysis Centre (Ang Mo Kio I)	106	0	0	109	0	0
Kwan Im Thong Hood Cho Temple - NKF Dialysis Centre (Simei)	135	0	0	145	0	0
Leong Hwa Chan Si Temple - NKF Dialysis Centre (Teck Whye)	107	0	0	104	0	0
New Creation Church - NKF Dialysis Centre	81	0	0	82	0	0
NKF Dialysis Centre (BLK 365 Woodlands II)	105	0	0	105	0	0
NKF Hougang Punggol Dialysis Centre	88	0	0	92	0	0
NTUC Income - NKF Dialysis Centre (Bukit Batok)	81	0	0	85	0	0
NTUC/Singapore Pools - NKF Dialysis Centre (Tampines)	112	0	0	112	0	0
Pei Hwa Foundation - NKF Dialysis Centre (Ang Mo Kio)	112	0	0	119	0	0
SAF - NKF Dialysis Centre (Clementi)	114	0	0	106	0	0
SAF - NKF Dialysis Centre (Hong Kah)	80	0	0	82	0	0
Sakyadhita -NKF Dialysis Centre (Upper Boon Keng)	93	0	0	96	0	0
Sheng Hong Temple - NKF Dialysis Centre (Jurong West)	104	0	0	112	0	0
SIA - NKF Dialysis Centre (Toa Payoh)	78	0	0	76	0	0
Singapore Buddhist Welfare Services - NKF Dialysis Centre (Hougang)	136	0	0	139	0	0
Singapore Pools - NKF Dialysis Centre (Bedok)	100	0	0	105	0	0
Tampines Chinese Temple - NKF Dialysis Centre (Pasir Ris)	68	0	0	69	0	0
Tay Choon Hye - NKF Dialysis Centre (Kim Keat)	104	0	0	107	0	0
Thong Teck Sian Tong Lian Sin SIA - NKF Dialysis Centre (Woodlands)	112	0	0	107	0	0
Toa Payoh Seu Teck Sean Tong - NKF Dialysis Centre (Yishun)	70	0	0	69	0	0
Western Digital - NKF Dialysis Centre (Ang Mo Kio)	148	0	0	148	0	0
Woh Hup - NKF Dialysis Centre (Ghim Moh)	111	0	0	113	0	0
Wong Sui Ha Edna - Nkf Dialysis Centre	68	0	0	91	0	0
KDF - Bishan Centre	105	0	0	102	0	0
KDF - Ghim Moh Centre (HD)	58	0	0	83	0	0
KDF - Ghim Moh Centre (PD)	0	42	0	0	36	0
KDF - Kreta Ayer (HD)	70	0	0	82	0	0
Peoples' Dialysis Centre	98	0	0	99	0	0
Sub-total	2845	42	0	2940	36	0
Private Dialysis Centres/Clinics	**HD**	**PD**	**TX**	**HD**	**PD**	**TX**
Advance Renal Care (Novena)	0	0	0	4	0	0
Advance Renal Therapy	37	0	0	30	0	0
ARC Kidney Dialysis Centre (Clementi Ave 3) Pte Ltd	44	0	0	50	0	0
Asia Kidney Dialysis Centre (Bedok)	33	0	0	42	0	0
Asia Kidney Dialysis Centre (Jurong)	0	0	0	26	0	0
Asia Kidney Dialysis Centre (TP)	41	0	0	56	0	0
Asia Kidney Dialysis Centre (TPY)	34	0	0	47	0	0
Asia Renal Care (Jurong) Pte Ltd	47	0	0	42	0	0
Asia Renal Care (Katong) Pte Ltd	43	0	0	45	0	0
Asia Renal Care (Kembangan) Pte Ltd	49	0	0	56	0	0
Asia Renal Care (Mt Elizabeth) Pte Ltd	24	1	0	24	1	0
B.Braun Avitum Dialysis Centre	37	0	0	52	0	0
Dialysis Centre - Youngberg Pte Ltd (Whampoa)	56	0	0	54	0	0
Dialysis Centre - Youngberg Pte Ltd (Kovan)	58	0	0	59	0	0
Dialysis Centre - Youngberg Pte Ltd (Serangoon)	49	0	0	46	0	0
FHC Dialysis Centre PTE LTD	22	0	0	36	0	0
Fresenius Medical Care (Teck Whye) Dialysis Clinic	0	0	0	6	0	0
Immanuel Dialysis Centre Pte Ltd (Ang Mo Kio)	38	0	0	37	0	0
Immanuel Dialysis Centre Pte Ltd (Mt Alvernia)	32	2	0	36	3	0
Immanuel Dialysis Centre Pte Ltd (Woodlands)	0	0	0	9	0	0
Immanuel Dialysis Centre Pte Ltd (Yishun)	0	0	0	12	0	0
Kidney Therapy Centre Pte Ltd (Marsiling Rd Blk136)	58	0	0	53	0	0
Kidney Therapy Centre Pte Ltd (YISHUN Blk 236)	45	0	0	48	0	0
KidneyCare Dialysis Centre @ Pasir Ris	0	0	0	20	0	0
Nephrocare GDI Pte Ltd	28	3	0	31	2	0
Nephrocare S & J Dialysis Centre (Boulvard)	42	0	0	36	0	0
Orthe Pte Ltd - (Bukit Batok)	46	0	0	38	0	0
Orthe Pte Ltd - (Orchard Rd , Lucky Plaza)	15	0	0	10	0	0
Orthe Pte Ltd (Blk 527, Bedok North Street 3)	0	0	0	11	0	0
Orthe Pte Ltd (Jurong West)	58	0	0	52	0	0
Orthe Pte Ltd (Tampines Blk 107)	57	0	0	61	0	0
Raffles Dialysis Centre	6	0	0	11	0	0
Renal & Dialysis Clinic (S) Pte Ltd (Deport Road)	11	0	0	16	0	0
Renal Health Pte Ltd	92	0	0	54	0	0
Renal Life (Hougang) Dialysis Centre Pte Ltd	0	0	0	11	0	0
Renal Life (W) Dialysis Centre Pte Ltd (Blk 207 Bukit Batok)	10	0	0	28	0	0
Renal Life Dialysis Centre Pte Ltd (Blk 463 Jurong West)	18	0	0	29	0	0
Renal Therapy Centre Pte Ltd - (Bedok Blk 744)	73	0	0	70	0	0
Renal Therapy Centre Pte Ltd (Ang Mo Kio Blk422)	64	0	0	58	0	0
Renal Therapy Centre Pte Ltd (Hougang BLK 620)	50	0	0	46	0	0
Renal Therapy Centre Pte Ltd (Jurong East Blk 326)	52	0	0	39	0	0
Renal Therapy Centre Pte Ltd (Toa Payoh Blk 92)	62	0	0	58	0	0
Renal Therapy Services Pte Ltd (Ang Mo Kio Blk 443)	45	0	0	41	0	0
Renal Therapy Services Pte Ltd (Bukit Merah Blk 161)	43	0	0	41	0	0

Private Dialysis Centres/Clinics	HD	PD	TX	HD	PD	TX
Renal Therapy Services Pte Ltd (Jurong East Blk 104)	91	0	0	83	0	0
Renal Therapy Services Pte Ltd (Yishun Ring Blk 236)	49	0	0	37	0	0
RenalTeam Dialysis Centre - Ang Mo Kio	0	0	0	11	0	0
RenalTeam Dialysis Centre - Bedok	1	0	0	20	0	0
RenalTeam Dialysis Centre - Jurong East	0	0	0	12	0	0
RenalTeam Dialysis Centre - Tampines	0	0	0	3	0	0
RenalTeam Dialysis Centre - Woodlands	0	0	0	17	0	0
Centre For Kidney Disease Pte Ltd (Lucky Plaza)	0	0	41	0	0	41
Grace Lee Renal And Medical Clinic Pte Ltd	0	0	12	0	0	11
Kidney & Medical Centre	0	0	5	0	0	5
Ku Kidney & Medical Centre	0	0	22	0	0	22
Raffles Hospital	0	1	4	0	1	3
Roger Kidney Clinic	0	0	3	0	0	6
SH Tan Kidney & Medical Clinic	0	0	0	0	0	2
Stephew Chew Centre for Kidney Disease and Hypertension	0	0	29	0	0	28
The Kidney Clinic Pte Ltd	0	0	2	0	0	5
The Singapore Clinic for Kidney Diseases	0	0	4	0	0	4
Wu Nephrology & Medical Clinic (Wu Medical Clinic Pte Ltd)	0	0	17	0	0	20
Overseas Transplantation	0	0	3	0	0	0
Sub-total	**1660**	**7**	**142**	**1814**	**7**	**147**
GRAND TOTAL	**4613**	**631**	**1407***	**4840**	**681**	**1434**

^ TX refers to number of transplanted patients
* 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 (CKD5).

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 (PAHs), HD is practised in various settings as follows:

1. PAHs where hospital-based centres provide total care dialysis;

2. Dialysis Centres run by Voluntary Welfare Organisations (VWOs) 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 dialysis centres (PTE) 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 PAHs. 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 the middle income households. Government subsidies are also provided for selected immunosuppressive drugs for subsidised patients in the public healthcare institutions to assist 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. VWOs 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. New patients are registered using Registry forms (Appendix I) while existing patients have their data reconfirmed and updated (e.g. change in dialysis modality and 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 (RRT). 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 body surface area, BSA, 1.73m^2) to the registry to replace serum creatinine listing for case findings. Similarly, the National University Hospital, which contributed about 20% of new cases, also follow suit from year 2009 onwards.

2. An event-driven basis where abbreviated forms are required to be submitted to the Registry to register a patient's change in dialysis location, modality or death whenever any of these events 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 to be 95% complete.

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™ 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 is running on IBM pSeries Unix servers. The 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 2012 – 2013 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 resident population (pmp).

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

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 of treatment and remained on it 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, a graft loss event was defined as return to dialysis or a preemptive renal transplant or death with a functioning graft. Deaths from all other causes were also considered as events for the calculations of patient survival.

Bio-clinical indicators

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

In this monograph, the numbers in tables and figures were rounded to one decimal place. In view of this, the percentages may not always add up to 100%.

5 SYNOPSIS 2012 – 2013

5.1 Dialysis

5.1.1 Stock and Flow (1999 – 2013)

Intake of new dialysis patients increased from 770 in 2009 to 975 in 2013.
Prevalent dialysis patients increased from 4,382 in 2009 to 5,521 in 2013.

The number of renal transplants varied between 84 and 96 in the period 2009 – 2013. Patients with functioning transplant increased from 1,328 in 2009 to 1,434 in 2013.

5.1.2 Demographics

5.1.2.1 New Patients Diagnosed with CKD5

Of the CKD5 patients, the proportion of males was 55.1% in 2012 and 56.8% in 2013. The mean age was 61.2 years (median 62.6) in 2012 and 60.8 years (median 61.1) in 2013; and the modal age group was 60 – 69 in both years.

Among the incident CKD5 patients, diabetic nephropathy, DN (64.4% in 2012, 63.5% in 2013) was the most common cause of CKD5. Primary glomerulonephritis (GN) accounted for 13.5% in 2012 and 13.9% in 2013 while hypertension and renovascular disease as a group accounted for 15.5% and 15.0% in 2012 and 2013 respectively.

5.1.2.2 New Patients on Dialysis

(1 January 2012 – 31 December 2012)

Of the 921 new CKD5 patients who survived 90 days after initiation of dialysis (Crude rate, CR 241.2 pmp; Age standardised rate, ASR 169.3 pmp), 55.7% were males. 785 patients (CR 205.6 pmp; ASR 143.0 pmp), i.e. 85.2% of those who survived 90 days after initiation of dialysis were on HD compared with 14.8% on PD. 57.3% of the patients surviving 90 days on dialysis were aged 60 years and above.

(1 January 2013 – 31 December 2013)

Of the 975 new CKD5 patients who survived 90 days after initiation of dialysis (CR 253.6 pmp; ASR 170.4 pmp), 55.6% were males. 802 patients (CR 208.6 pmp; ASR 139.6 pmp), i.e. 82.3% of those who survived 90 days after initiation of dialysis were on HD compared with 17.7% on PD. 55.0% of the patients surviving 90 days on dialysis were aged 60 years and above.

5.1.2.3 Existing Patients on Dialysis

(As of 31 December 2012)

Of the 5,244 prevalent patients on dialysis (CR 1,373.6 pmp; ASR 948.7 pmp), 54.6% were males. There were 4,613 patients (CR 1,208.3 pmp; ASR 828.8 pmp), i.e. 88.0% on HD and 631 patients (CR 165.3 pmp; ASR 119.9 pmp), i.e. 12.0% on PD. 52.9% of them were aged 60 years and above.

(As of 31 December 2013)

Of the 5,521 prevalent patients on dialysis (CR 1,436.1 pmp; ASR 961.3 pmp), 55.0% were males. There were 4,840 patients (CR 1,259.0 pmp; ASR 837.5 pmp), i.e. 87.7% on HD and 681 patients (CR 177.1 pmp; ASR 123.7 pmp), i.e. 12.3% on PD. 53.9% of them were aged 60 years and above.

5.1.3 Primary Renal Disease

DN and primary GN were the commonest cause of CKD5 among the new patients on dialysis at 65.6% and 15.5% respectively in 2012. 41.3% (59 out of 143) of primary GN cases were biopsy-proven of which IgA nephropathy was the commonest at 14.7% (21 out of 143). Secondary GN and other autoimmune diseases accounted for another 1.5% (14 out of 921) of CKD5.

Similar to year 2012, DN and primary GN were the commonest cause of CKD5 at 65.0% and 16.0% respectively in 2013. Only 35.3% (55 out of 156) of primary GN cases were biopsy-proven of which IgA nephropathy was the commonest at 25.0% (39 out of 156). Secondary GN and other autoimmune diseases accounted for another 1.0% (10 out of 975) of CKD5.

For the prevalent patients on dialysis in 2012, 29.7% (1,555 out of 5,244) and 48.3% (2,533 out of 5,244) had primary GN and DN as the cause of CKD5 respectively. Among those who had primary GN, 28.7% of them (446 out of 1,555) were biopsy proven. Secondary GN and other autoimmune diseases accounted for another 2.2% (116 out of 5,244) of CKD5. Of the biopsy-proven primary GN, IgA nephropathy accounted for 53.4% (238 out of 446).

For the prevalent patients on dialysis in 2013, 28.5% (1,574 out of 5,521) and 49.7% (2,744 out of 5,521) had primary GN and DN as the cause of CKD5 respectively. Among those who had primary GN, 30.2% of them (476 out of 1,574) were biopsy proven. Secondary GN and other autoimmune diseases accounted for another 2.1% (114 out of 5,521) of CKD5. Of the biopsy-proven primary GN, IgA nephropathy accounted for 55.5% (264 out of 476).

5.1.4 Co-morbid Conditions

In year 2012, prevalent dialysis patients had the following co-morbidities: diabetes mellitus, DM (56.0%), ischaemic heart disease, IHD (46.8%), cerebrovascular disease, CVD (20.2%), peripheral vascular disease and PVD (15.5%). 3.8% of them had positive Hepatitis B surface antigen (HBsAg).

In year 2013, prevalent dialysis patients had the following co-morbidities: DM (57.6%), IHD (46.3%), CVD (20.5%) and PVD (15.1%). 3.4% of them had positive HBsAg.

5.1.5 Haemodialysis (HD)

In 2012, 785 incident patients survived 90 days on HD (CR 205.6 pmp; ASR 143.0 pmp). There were 4,613 prevalent patients (CR 1,208.3 pmp; ASR 828.8 pmp) on HD with mean age of 61.4 years. 57.1% of patients were aged 60 years and above. Majority of prevalent patients were dialysed in centres managed by VWOs (67.1%) followed by PTE (36.0%) and PAHs (2.3%).

In 2013, 802 incident patients survived 90 days on HD (CR 208.6 pmp; ASR 139.6 pmp). There were 4,840 prevalent patients (CR 1,259.0 pmp; ASR 837.5 pmp) on HD with mean age of 61.7 years. 51.4% of patients were aged 60 years and above. Majority of prevalent patients were dialysed in centres managed by VWOs (60.7%) followed by PTE (37.5%) and PAHs (1.8%).

5.1.6 Peritoneal Dialysis (PD)

In 2012, 136 incident patients who survived 90 days were on PD (CR 35.6 pmp; ASR 26.3 pmp). There were 631 prevalent patients (CR 165.3 pmp; ASR 119.9 pmp) on PD with mean age of 60.2 years. 57.7% were aged 60 years and above. Majority received treatment in PAHs (92.2%).

In 2013, 173 incident patients who survived 90 days were on PD (CR 45.0 pmp; ASR 30.8 pmp). There were 681 prevalent patients (CR 177.1 pmp; ASR 123.7 pmp) on PD with mean age of 60.8 years. 57.6% were aged 60 years and above. Majority received treatment in PAHs (93.7%).

5.1.7 Dialysis Deaths

In 2012, there were 653 deaths at a rate of 11.0%. The death rate for those on HD was at 10.2% and PD at 16.1%. Cardiac events and infection were the commonest cause of death at 35.1% and 30.8% respectively; cerebrovascular death was at 6.6%.

In 2013, there were 771 deaths with a death rate of 12.1%. The death rate for those on HD was at 11.8% and PD at 14.4%.

Cardiac events and infection were the commonest cause of death at 34.8% and 31.1% respectively; cerebrovascular death was at 4.5%.

5.1.8 Survival Analysis

Patient survival for HD was 59.7% at 5 years for the period 1999 – 2013. The corresponding figure for PD was 35.9% at 5 years. The median survival was 6.6 years for HD patients and 3.6 years for PD patients.

5.1.9 Management of Dialysis Patients

In year 2012, the median Hb level was 11.2 g/dl (Range: 5.1 – 18.5) among HD patients, and 10.8 g/dl (Range: 6.5 – 17.9) among PD patients.

In year 2013, the median Hb level was 11.2 g/dl (Range: 4.8 – 18.8) among HD patients, and 10.8 g/dl (Range: 5.5 – 18.7) among PD patients.

In 2012, the percentage of HD patients on erythropoiesis stimulating agents (ESA) with transferrin saturation, TSAT ≥ 20% was 88.5% for patients with Hb ≥ 10 g/dl, and 75.5% for patients with Hb < 10 g/dl. Similarly, the percentage of PD patients on ESA with TSAT ≥ 20% was 84.0% for patients with Hb ≥ 10 g/dl, and 74.2% for patients with Hb < 10 g/dl.

In 2013, the percentage of HD patients on ESA with TSAT ≥ 20% was 86.8% for patients with Hb ≥ 10 g/dl, and 74.1% for patients with Hb < 10 g/dl. Similarly, the percentage of PD patients on ESA with TSAT ≥ 20% was 82.0% for patients with Hb ≥ 10 g/dl, and 72.7% 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 – 2013.

The average serum albumin level among the PD patients was lower than that among the HD patients. In year 2013, the mean serum albumin level was 38.0 g/L for the HD patients and 34.0 g/L for the PD patients.

Among the HD and PD patients, the mean corrected calcium level among the HD and PD patients remained constant at 2.3 mmol/L across the years in 2008 – 2013. Similarly, the mean phosphate level was about 1.6 mmol/L across the years in 2008 – 2013.

Among the HD and PD patients, the average iPTH level was similar. It was also observed that the iPTH values could be unusually elevated. The median iPTH level ranged from 23.9 to 38.7 pmol/L among the HD patients, and from 26.9 to 29.1 pmol/L among the PD patients. In year 2013, the median iPTH level for HD patients was 38.7 pmol/L (Range: 0.1 – 629.8), and for PD patients was 29.1 pmol/L (Range: 0.2 – 366.0).

5.2 Transplants

5.2.1 Demographics

5.2.1.1 New Transplant Patients

There were 51 (CR 13.4 pmp) new kidney transplant recipients in 2012. Of these, males comprised 50.0%. In addition, 11 patients in 2012 (CR 2.9 pmp) received transplants overseas.

There were 69 (CR 17.9 pmp) new kidney transplant recipients in 2013. Of these, males comprised 58.3%. In addition, 15 patients in 2013 (CR 3.9 pmp) received transplants overseas.

5.2.1.2 Prevalent Transplanted Patients

As of 31 December 2012

There were 1,407 prevalent transplant patients (CR 368.5 pmp, ASR 261.8 pmp) in 2012. Of these, 53.1% were males. Mean age was 52.8 years. The prevalent transplant population was predominately Chinese (82.4%).

As of 31 December 2013

There were 1,434 prevalent transplant patients (CR 373.0 pmp, ASR 261.0 pmp) in 2013. Of these, 52.9% were males. Mean age was 53.2 years. The prevalent transplant population was predominately Chinese (81.9%).

5.2.2 Primary Renal Disease

For the prevalent transplanted population, the commonest known primary renal disease was primary GN at 70.7% in 2012 and 70.5% in 2013. DN accounted for 7.7% in 2012 and 2013 while autoimmune disease accounted for 4.3% in 2012 and 4.5% in 2013.

5.2.3 Co-morbid Conditions

Co-morbidities for prevalent transplanted patients in year 2012 included DM (26.8%), IHD (16.1%), CVD (4.8%) and PVD (2.3%). 3.3% had positive HBsAg.

Co-morbidities for prevalent transplanted patients in year 2013 included DM (26.0%), IHD (15.7%), CVD (5.2%) and PVD (2.3%). 3.5% had positive HBsAg.

5.2.4 Location where Transplant was Performed

Among prevalent patients in 2012, the transplants performed at the Singapore General Hospital constituted 47.6%, followed by overseas centres at 29.6% and the National University Hospital at 17.6%.

Among prevalent patients in 2013, the transplants performed at the Singapore General Hospital constituted 47.2%, followed by overseas centres at 28.9% and the National University Hospital at 18.5%.

5.2.5 Donor Type

Among prevalent patients in 2012, deceased-donor transplantation constituted the highest at 64.5% (589 local, 318 overseas). Living-donor transplant, either biologically or emotionally related was the next most common at 29.9% (397 local, 23 overseas), while unrelated living-donor transplant constituted 5.3%.

Among prevalent patients in 2013, deceased-donor transplantation constituted the highest at 62.7% (591 local, 309 overseas). Living-donor transplant, either biologically or emotionally related was the next most common at 29.6% (424 local, 24 overseas), while unrelated living-donor transplant constituted 5.1%.

5.2.6 Survival Analysis

Transplant patient survival was 97.8% at 1 year and 92.5% at 5 years for patients transplanted in the period 1999 to 2013. The corresponding 1 and 5-years graft survivals were 94.8% and 89.4% respectively.

6 STOCK AND FLOW

The number of incident (770 cases in 2009 to 975 cases in 2013) and prevalent dialysis patients (4,382 cases in 2009 to 5,521 cases in 2013) has increased over the years. The number of renal transplants varied through the years from 2009 to 2013 (range from 62 in 2012 to 96 in 2009). Patients with functioning transplant have increased from 1,328 to 1,434 over the same period. See Table 6.1.

Table 6.1: STOCK AND FLOW OF RRT, 2009 – 2013

Stock and Flow of RRT 2009 – 2013	2009	2010	2011	2012	2013
New Dialysis patients	770	741	903	921	975
New Transplants	96	84	92	62	84
Dialysis deaths	603	560	663	653	771
Transplant deaths*	27	18	20	30	39
Dialysis as at 31st December	4382	4596	4895	5244	5521
Functioning transplants as at 31st December	1328	1367	1407	1407	1434

* Refers to all transplant deaths that occurred among all new and functioning transplants during a particular year

Figure 6.1: NEW DIALYSIS PATIENTS, 1999 – 2013

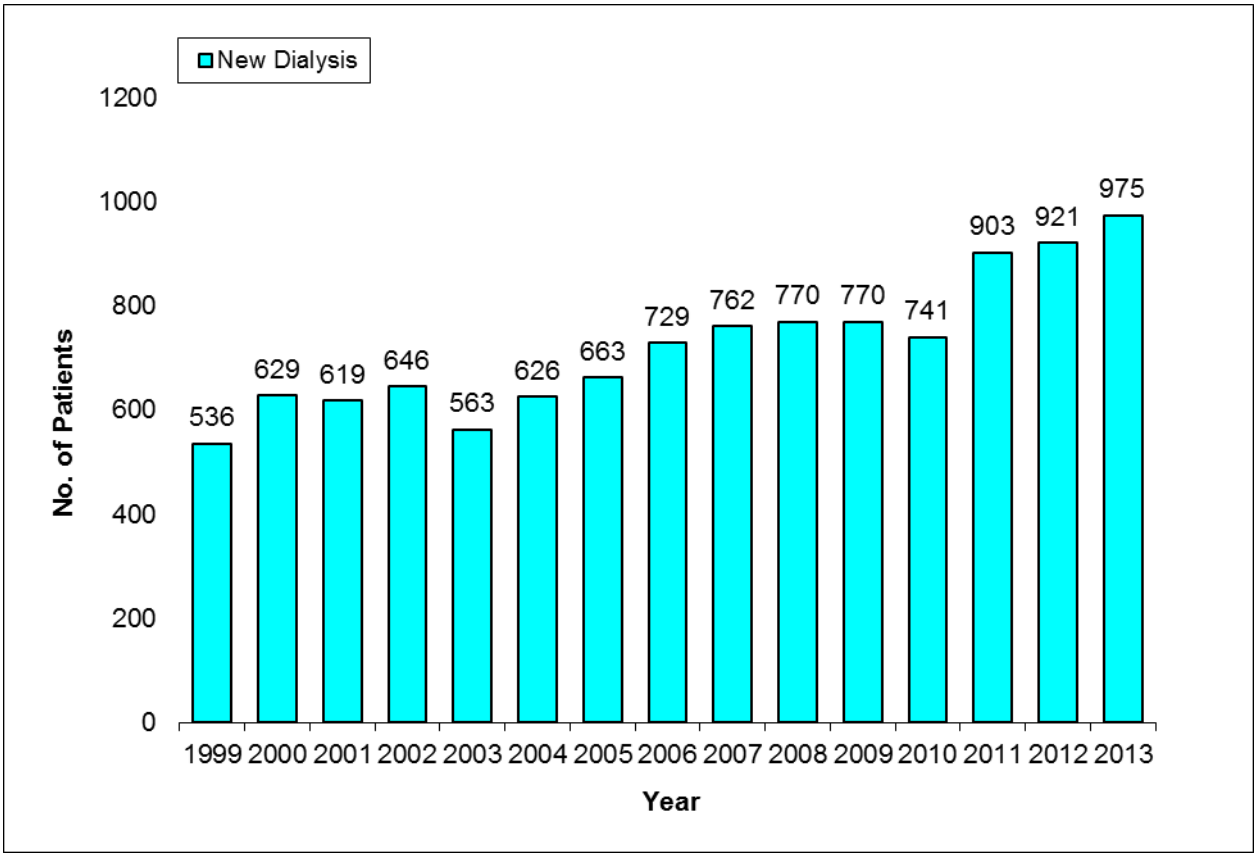


Figure 6.2: NEW TRANSPLANTS, 1999 – 2013

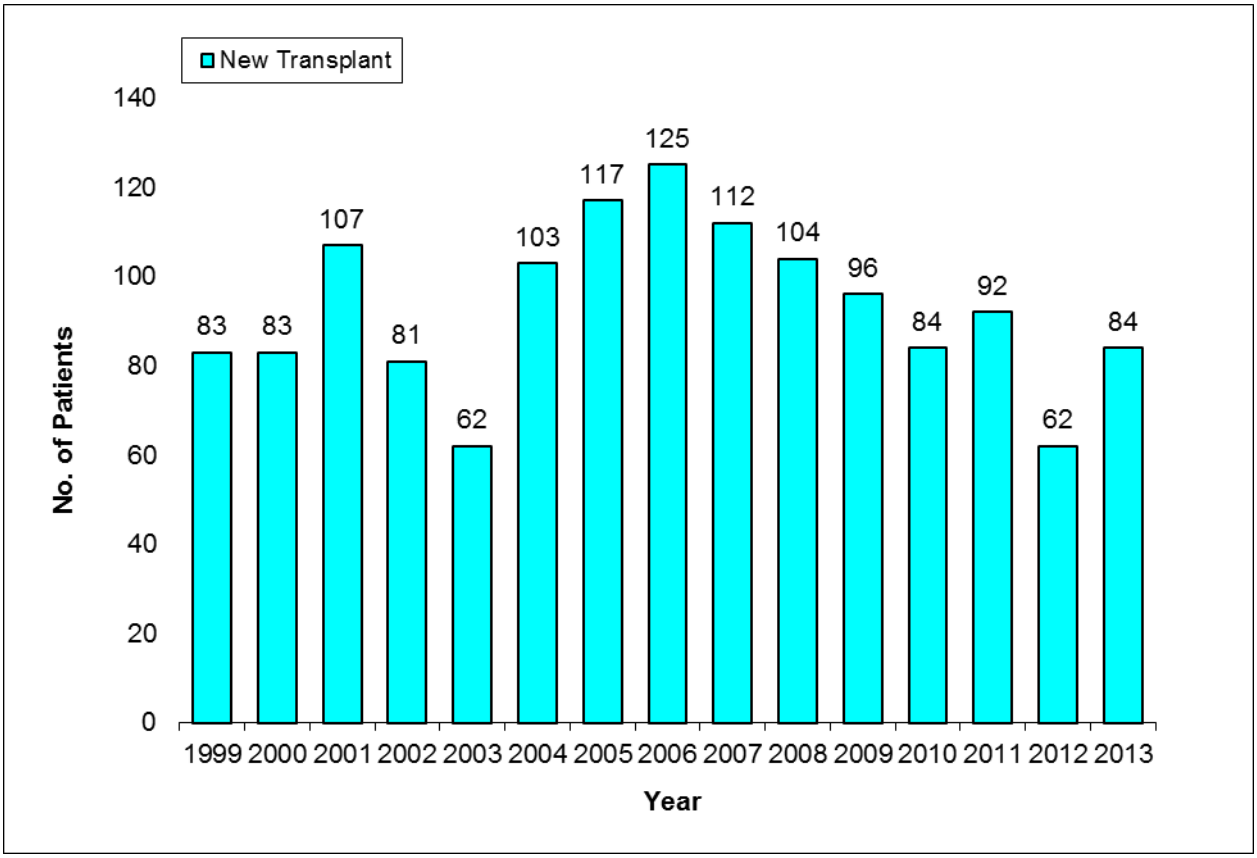


Figure 6.3: PREVALENT DIALYSIS PATIENTS AS AT 31ST DECEMBER, 1999 – 2013

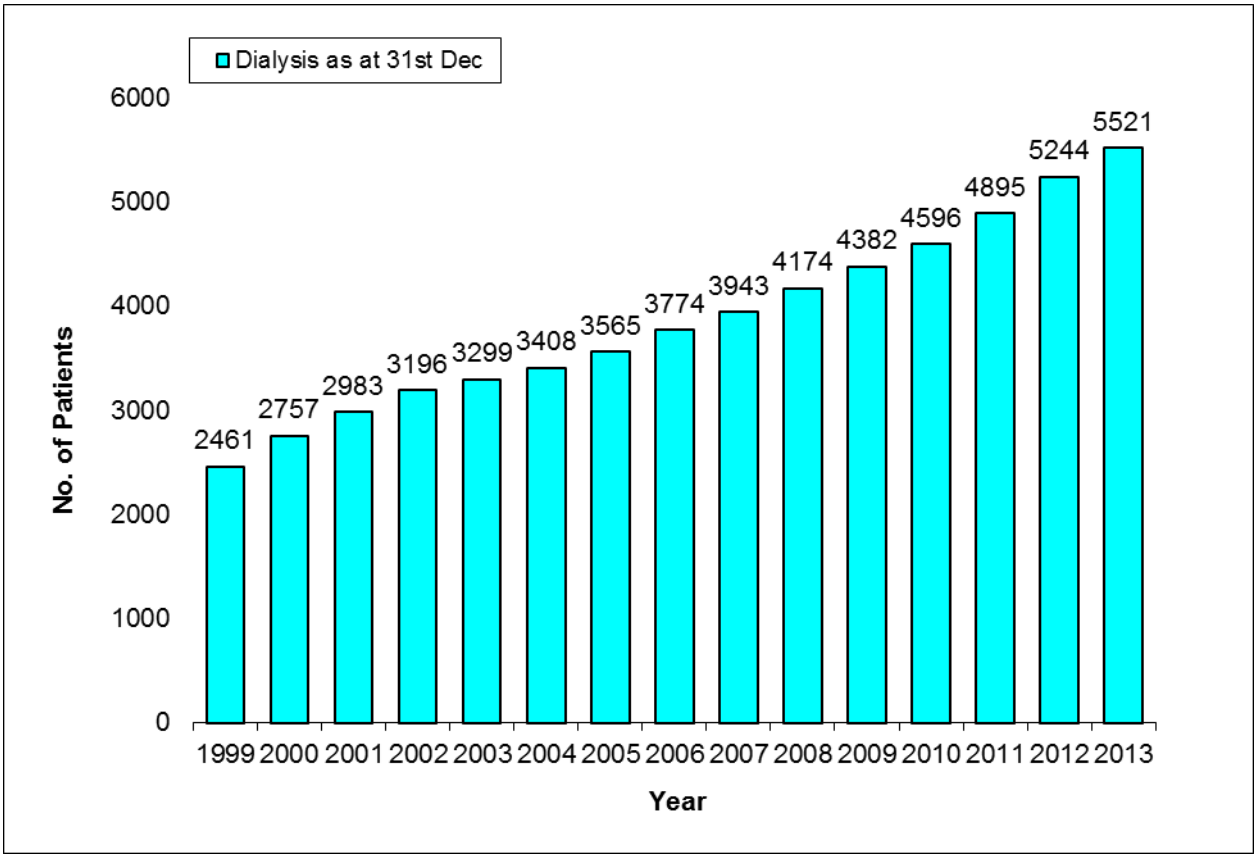
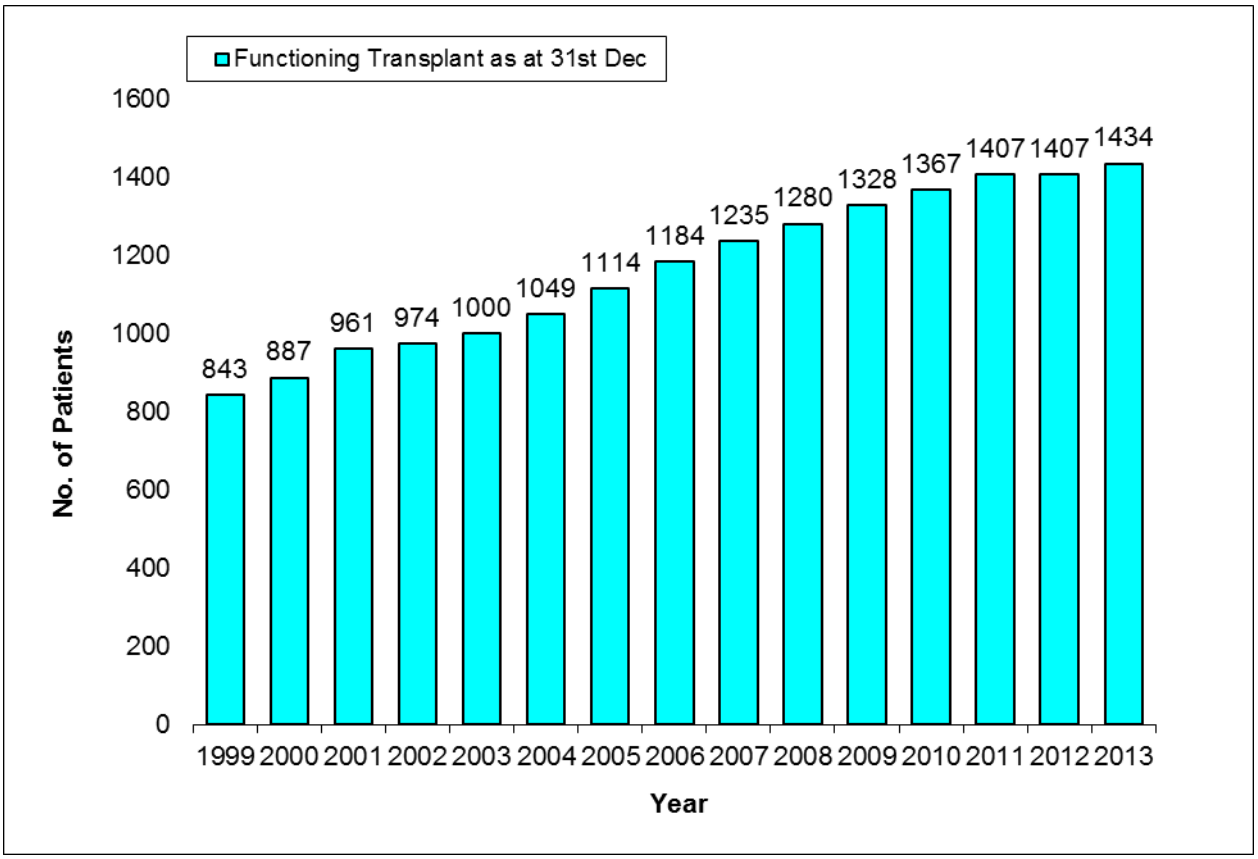


Figure 6.4: FUNCTIONING TRANSPLANT AS AT 31ST DECEMBER, 1999 – 2013



7 THE CKD5 POPULATION

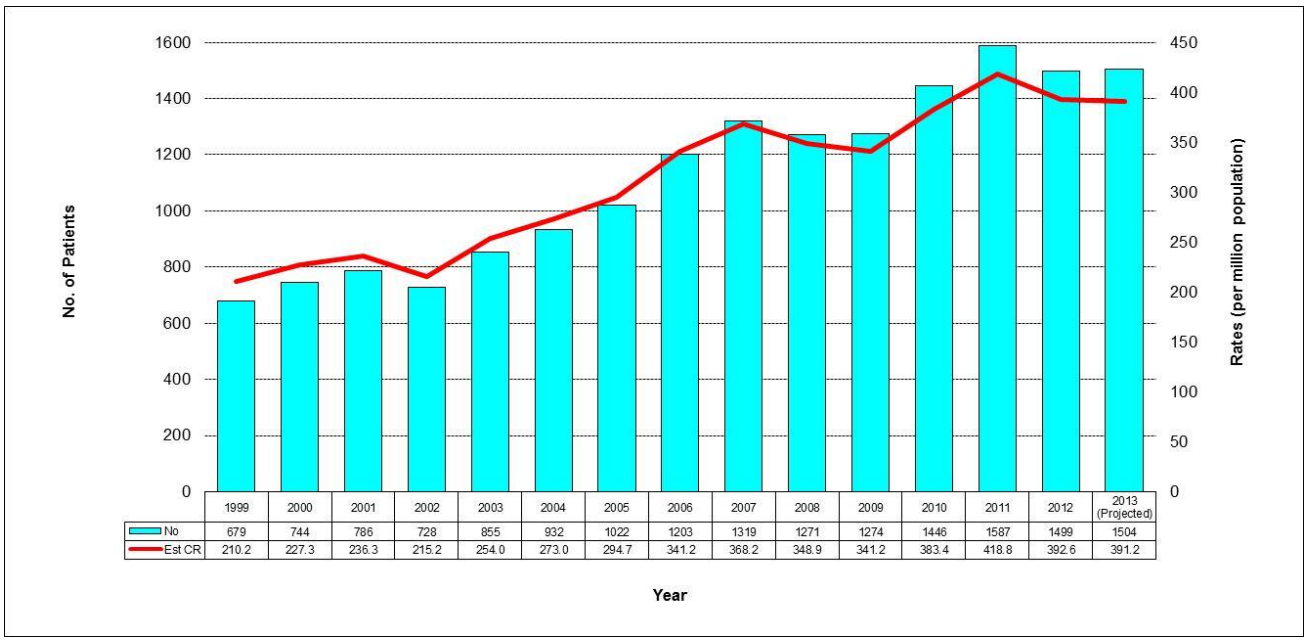
7.1 Incidence and Prevalence

7.1.1 Introduction

This section reports the incidence and prevalence of 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 2013. In year 2012, there were 1,499 new CKD5 patients (CR: 392.6 pmp). Similarly, in year 2013, it was projected that there would be 1,504 new CKD5 patients (CR: 391.2 pmp). To date, 1,075 patients were diagnosed with CKD5 in 2013 (CR: 279.6 pmp).

Figure 7.1.1.1: CRUDE RATES AND TOTAL FOR CKD5, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 (Projected)
No	679	744	786	728	855	932	1022	1203	1319	1271	1274	1446	1587	1499	1504
Est CR	210.2	227.3	236.3	215.2	254.0	273.0	294.7	341.2	368.2	348.9	341.2	383.4	418.8	392.6	391.2

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 55.1% in 2012 and 56.8% in 2013. The mean and median age was 61.2 and 62.6 years respectively in 2012; and 60.8 and 61.1 years respectively in 2013; 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

2012 Age group	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	5	0.6	3	0.4	8	0.5
20–29	13	1.6	12	1.8	25	1.7
30–39	24	2.9	21	3.1	45	3.0
40–49	95	11.5	61	9.1	156	10.4
50–59	199	24.1	113	16.8	312	20.8
60–69	220	26.6	152	22.6	372	24.8
70–79	169	20.5	158	23.5	327	21.8
80+	101	12.2	153	22.7	254	16.9
All Age Groups	**826**	**100**	**673**	**100**	**1499**	**100**

2013 Age group	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	3	0.5	0	0.0	3	0.3
20–29	8	1.3	10	2.2	18	1.7
30–39	24	3.9	12	2.6	36	3.3
40–49	81	13.3	43	9.3	124	11.5
50–59	169	27.7	99	21.3	268	24.9
60–69	163	26.7	118	25.4	281	26.1
70–79	112	18.3	110	23.7	222	20.7
80+	51	8.3	72	15.5	123	11.4
All Age Groups	**611**	**100**	**464**	**100**	**1075**	**100**

7.1.2.2 Incident CKD5 Patients by Ethnic Group and Gender

The majority of patients were Chinese (68.4% in 2012, 65.0% in 2013) 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 male predominance among the Chinese in both years. Malay females outnumbered their male counterparts in 2012, but in 2013, this gap had converged. For the Indians, there were more males than females in 2012, but in 2013, the converse was true.

Table 7.1.2.2: INCIDENT CKD5 PATIENTS BY ETHNIC GROUP AND GENDER

2012 Ethnic group	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	603	73.0	422	62.7	1025	68.4
Malay	147	17.8	195	29.0	342	22.8
Indian	61	7.4	49	7.3	110	7.3
Others	15	1.8	7	1.0	22	1.5
All Ethnic Groups	**826**	**100**	**673**	**100**	**1499**	**100**

2013 Ethnic group	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	431	70.5	268	57.8	699	65.0
Malay	139	22.7	136	29.3	275	25.6
Indian	28	4.6	52	11.2	80	7.4
Others	13	2.1	8	1.7	21	2.0
All Ethnic Groups	**611**	**100**	**464**	**100**	**1075**	**100**

7.1.2.3 Incident CKD5 Patients by Aetiology

Among the incident CKD5 patients, DN (64.4% in 2012, 63.5% in 2013) was the most common cause of CKD5. Primary GN accounted for 13.5% in 2012 and 13.9% in 2013 while hypertension and renovascular disease as a group accounted for 15.5% and 15.0% in 2012 and 2013 respectively (Table 7.1.2.3).

Table 7.1.2.3: INCIDENT CKD5 PATIENTS BY AETIOLOGY

Cause of CKD5	2012		2013	
	No	%	No	%
Diabetic Nephropathy (DN)	965	64.4	683	63.5
Primary Glomerulonephritis (GN)	202	13.5	149	13.9
Autoimmune Disease/GN with Systemic Manifestations	14	0.9	11	1.0
Hypertension and Renovascular Disease (HYP)	232	15.5	161	15.0
Polycystic Kidney Disease/Other Cystic Diseases	23	1.5	30	2.8
Vesicoureteric Reflux/Chronic Pyelonephritis	1	0.1	3	0.3
Obstruction	20	1.3	10	0.9
Stone Disease	1	0.1	2	0.2
Miscellaneous	33	2.2	24	2.2
Unknown	8	0.5	2	0.2
All Causes	**1499**	**100**	**1075**	**100**

In 2012, there were 104 patients with no co-morbidity (defined as DM, IHD or CVD), 212 patients with 1 co-morbidity, 292 with 2 co-morbidities and 311 patients with more than 2 co-morbidities. In 2013, there were 135 patients with no co-morbidity, 237 patients with 1 co-morbidity, 282 patients with 2 co-morbidities and 320 patients with more than 2 co-morbidities.

DM as a co-morbid condition occurred in 70.6% of CKD5 patients in 2012 and 69.3% in 2013. IHD was reported in 46.3% of patients in 2012 and 46.0% in 2013. CVD was reported at 28.8% in 2012 and 25.1% in 2013. Among the CKD5 patients, there were 10.2% current smokers in 2012 and 11.2% in 2013. Another 24.6% in 2012 and 23.5% in 2013 were former smokers. The smoking status was unknown in 2.5% and 2.9% of patients in 2012 and 2013 respectively. 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	**2012**		**2013**	
	No	**%**	**No**	**%**
Yes	1058	70.6	745	69.3
No	441	29.4	329	30.6
Unknown	0	0.0	1	0.1
Total	**1499**	**100**	**1075**	**100**
Ischaemic Heart Disease	**2012**		**2013**	
	No	**%**	**No**	**%**
Yes	694	46.3	495	46.0
No	803	53.6	578	53.8
Unknown	2	0.1	2	0.2
Total	**1499**	**100**	**1075**	**100**
Cerebrovascular Disease	**2012**		**2013**	
	No	**%**	**No**	**%**
Yes	431	28.8	270	25.1
No	1065	71.0	800	74.4
Unknown	3	0.2	5	0.5
Total	**1499**	**100**	**1075**	**100**
Smoking	**2012**		**2013**	
	No	**%**	**No**	**%**
Current Smoker	153	10.2	120	11.2
Ex-Smoker	369	24.6	253	23.5
Non-Smoker/Never	939	62.6	671	62.4
Unknown	38	2.5	31	2.9
Total	**1499**	**100**	**1075**	**100**

7.1.2.5 Incident CKD5 Patients by Service Providers

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

Table 7.1.2.5: INCIDENT CKD5 PATIENTS BY SERVICE PROVIDERS

Service Provider	2012		2013	
	No	%	No	%
Public Acute Hospitals	1433	95.6	1037	96.5
Voluntary Welfare Organisations	0	0.0	0	0.0
Private Centres	66	4.4	38	3.5
All Providers	**1499**	**100**	**1075**	**100**

8 THE DIALYSIS POPULATION

8.1 Incidence and Prevalence

8.1.1 Introduction

This section reports the incidence and prevalence of CKD5 treated with dialysis.

Table 8.1.1.1: INCIDENT AND PREVALENT DIALYSIS PATIENTS

	2012			2013		
	No	CR*	ASR*	No	CR*	ASR*
New CKD5 patients	1499	392.6	263.9	1075	279.6	184.6
New patients ever started on dialysis	1079	282.6	195.3	1178	306.4	204.4
– On Haemodialysis	999	261.7	180.4	1083	281.7	187.7
– On Peritoneal Dialysis	80	21.0	14.8	95	24.7	16.7
New patients for preceding one year surviving 90 days	921	241.2	169.3	975	253.6	170.4
– On Haemodialysis	785	205.6	143.0	802	208.6	139.6
– On Peritoneal Dialysis	136	35.6	26.3	173	45.0	30.8
Prevalence of patients on Dialysis	5244	1373.6	948.7	5521	1436.1	961.3
– On Haemodialysis	4613	1208.3	828.8	4840	1259.0	837.5
– On Peritoneal Dialysis	631	165.3	119.9	681	177.1	123.7
Dialysis death for preceding one year	653	171.0	115.2	771	200.6	130.4
Transplanted in Singapore	51	13.4	-	69	17.9	-
Transplanted in Overseas	11	2.9	-	15	3.9	-
Transplanted death with functioning graft	30	7.9	-	37	9.6	-
Transplanted death with graft loss	0	0.0	-	2	0.5	-
Transplanted with graft loss	32	8.4	-	18	4.7	-
Prevalent Transplant Population	1407	368.5	261.8	1434	373.0	261.0

* per million resident population

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

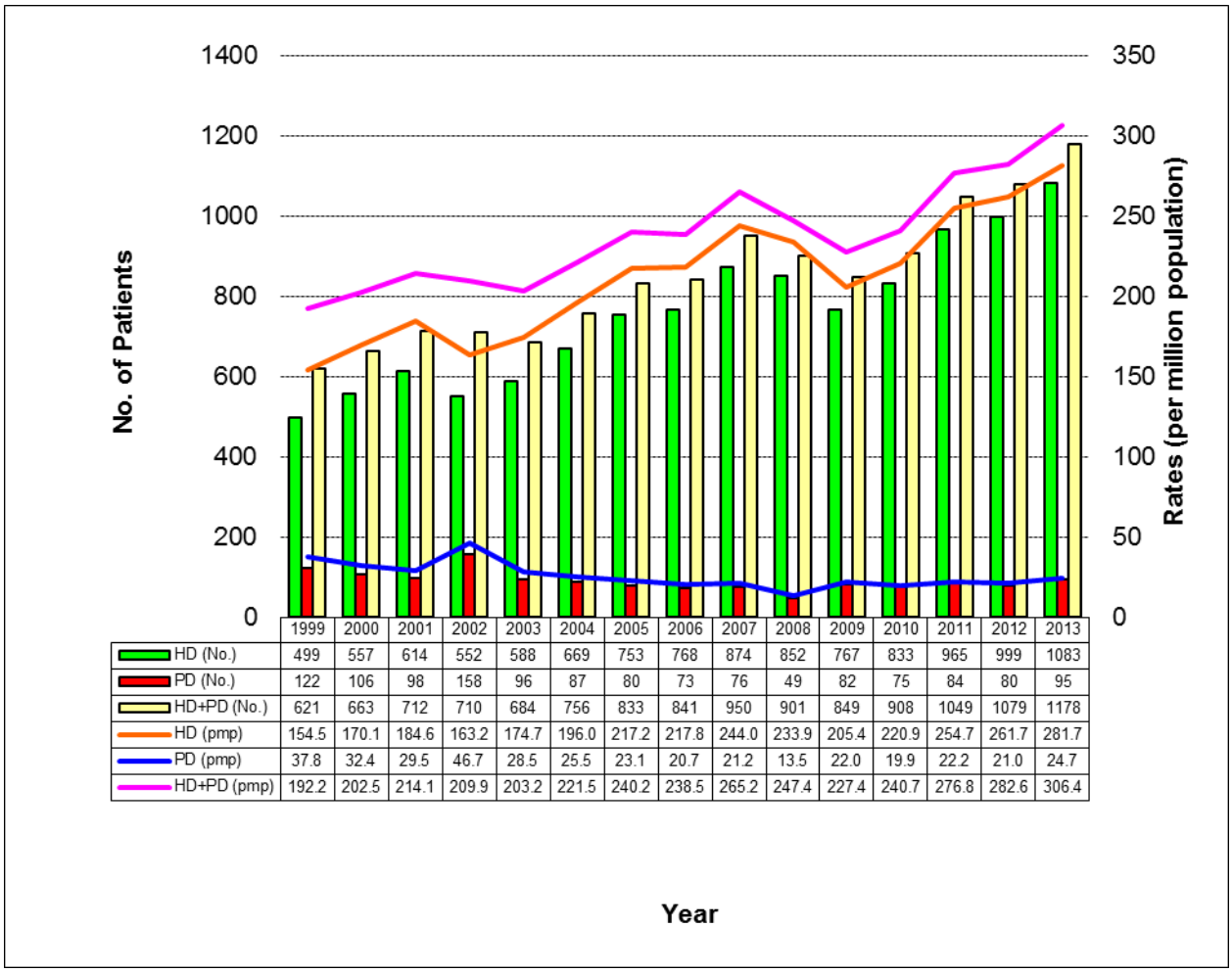
During the period of 1 January to 31 December in 2012, 1,499 patients (CR 392.6 pmp; ASR 263.9 pmp) were diagnosed with CKD5. See Table 8.1.1.1. In the same year, 1,079

patients were started on dialysis. Of these, 921 patients (CR 241.2 pmp; ASR 169.3 pmp) survived 90 days after initiation in 2012.

During the same period in 2013, 1,075 patients (CR 279.6 pmp; ASR 184.6 pmp) were diagnosed with CKD5. There were 1,178 patients who started dialysis of which 975 patients (CR 253.6 pmp; ASR 170.4 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 – 2013

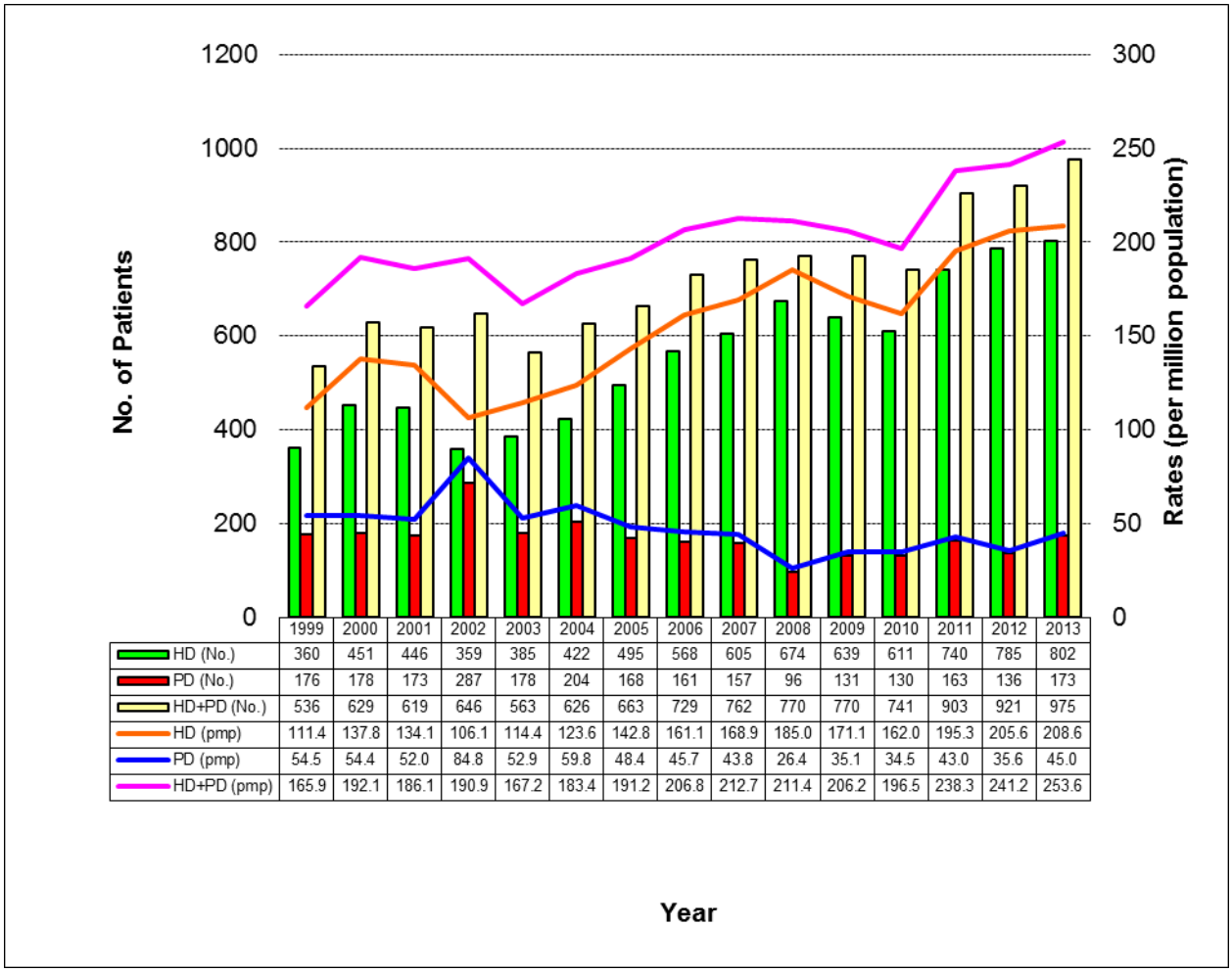


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD (No.)	499	557	614	552	588	669	753	768	874	852	767	833	965	999	1083
PD (No.)	122	106	98	158	96	87	80	73	76	49	82	75	84	80	95
HD+PD (No.)	621	663	712	710	684	756	833	841	950	901	849	908	1049	1079	1178
HD (pmp)	154.5	170.1	184.6	163.2	174.7	196.0	217.2	217.8	244.0	233.9	205.4	220.9	254.7	261.7	281.7
PD (pmp)	37.8	32.4	29.5	46.7	28.5	25.5	23.1	20.7	21.2	13.5	22.0	19.9	22.2	21.0	24.7
HD+PD (pmp)	192.2	202.5	214.1	209.9	203.2	221.5	240.2	238.5	265.2	247.4	227.4	240.7	276.8	282.6	306.4

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.

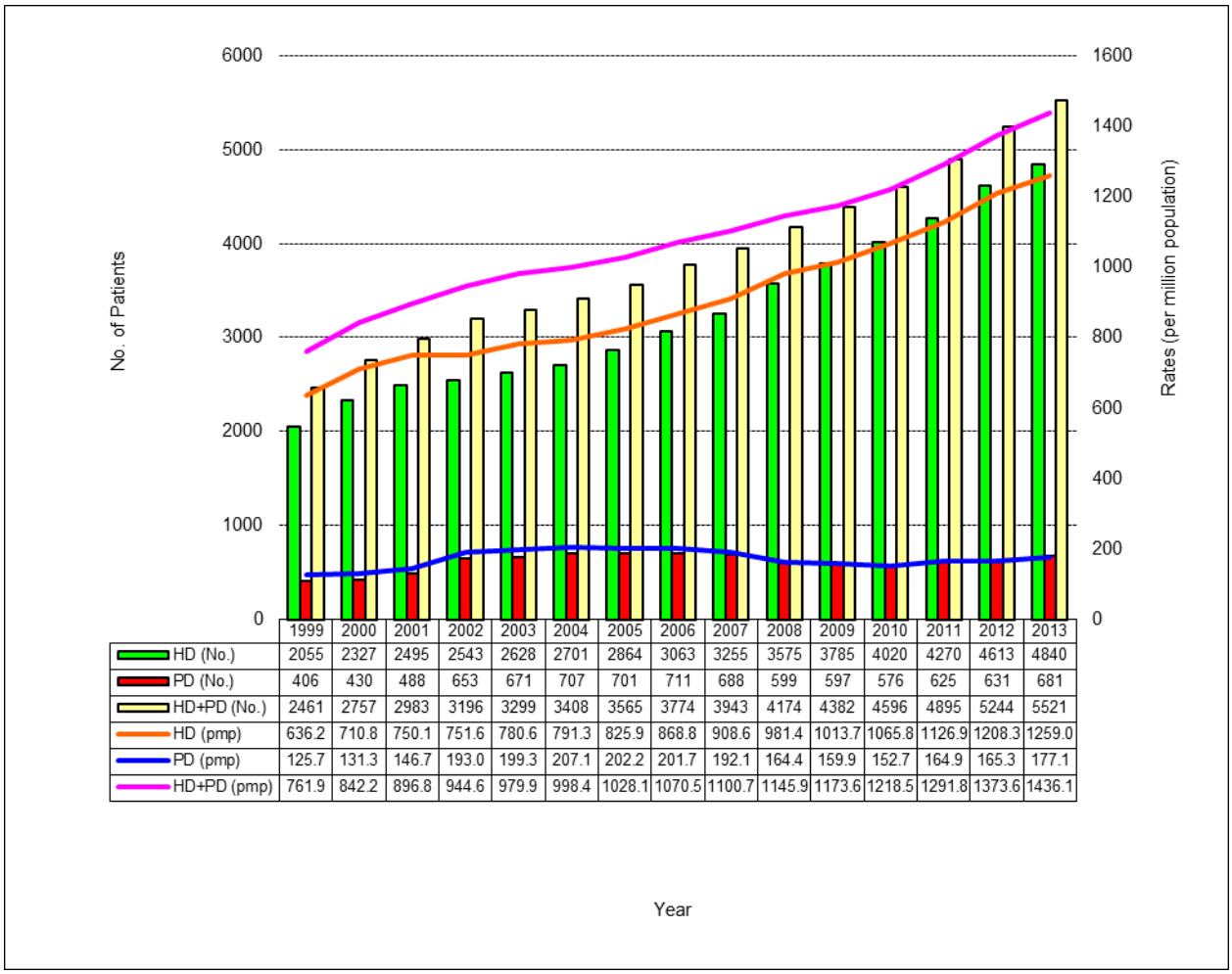
Figure 8.1.1.2: CRUDE RATES AND TOTAL FOR DEFINITIVE DIALYSIS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD (No.)	360	451	446	359	385	422	495	568	605	674	639	611	740	785	802
PD (No.)	176	178	173	287	178	204	168	161	157	96	131	130	163	136	173
HD+PD (No.)	536	629	619	646	563	626	663	729	762	770	770	741	903	921	975
HD (pmp)	111.4	137.8	134.1	106.1	114.4	123.6	142.8	161.1	168.9	185.0	171.1	162.0	195.3	205.6	208.6
PD (pmp)	54.5	54.4	52.0	84.8	52.9	59.8	48.4	45.7	43.8	26.4	35.1	34.5	43.0	35.6	45.0
HD+PD (pmp)	165.9	192.1	186.1	190.9	167.2	183.4	191.2	206.8	212.7	211.4	206.2	196.5	238.3	241.2	253.6

There were an increasing number of prevalent patients in both dialysis modalities from 1999 to 2013. See Figure 8.1.1.3.

Figure 8.1.1.3: CRUDE RATES AND TOTAL FOR PREVALENT DIALYSIS PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD (No.)	2055	2327	2495	2543	2628	2701	2864	3063	3255	3575	3785	4020	4270	4613	4840
PD (No.)	406	430	488	653	671	707	701	711	688	599	597	576	625	631	681
HD+PD (No.)	2461	2757	2983	3196	3299	3408	3565	3774	3943	4174	4382	4596	4895	5244	5521
HD (pmp)	636.2	710.8	750.1	751.6	780.6	791.3	825.9	868.8	908.6	981.4	1013.7	1065.8	1126.9	1208.3	1259.0
PD (pmp)	125.7	131.3	146.7	193.0	199.3	207.1	202.2	201.7	192.1	164.4	159.9	152.7	164.9	165.3	177.1
HD+PD (pmp)	761.9	842.2	896.8	944.6	979.9	998.4	1028.1	1070.5	1100.7	1145.9	1173.6	1218.5	1291.8	1373.6	1436.1

8.1.2 Incident Dialysis Patients

8.1.2.1 Incident Dialysis Patients by Age Group and Gender

Among definitive dialysis patients, males comprised 55.7% who survived 90 days after commencement of dialysis in 2012 while this was 55.6% in 2013. In 2012, the modal age group was 60 – 69 years; and the corresponding proportion of CKD5 patients aged 60 years and above at initiation of dialysis was 57.3%. Similarly, in 2013, the modal age group was 60 – 69 years; and the proportion of CKD5 patients aged 60 years and above at initiation of dialysis was 52.8%. See Table 8.1.2.1.1.

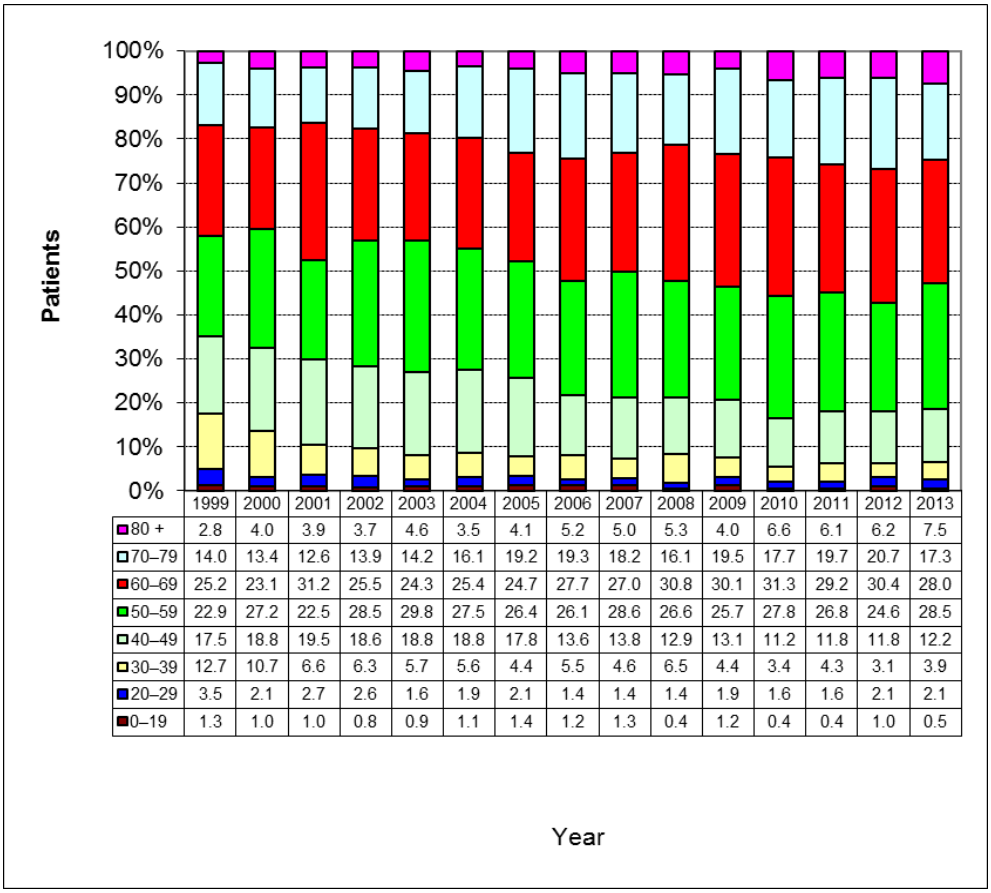
Table 8.1.2.1.1: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	6	1.2	3	0.7	9	1.0
20–29	6	1.2	13	3.2	19	2.1
30–39	19	3.7	10	2.5	29	3.1
40–49	60	11.7	49	12.0	109	11.8
50–59	145	28.3	82	20.1	227	24.6
60–69	156	30.4	124	30.4	280	30.4
70–79	99	19.3	92	22.5	191	20.7
80 +	22	4.3	35	8.6	57	6.2
All Age Groups	**513**	**100**	**408**	**100**	**921**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	4	0.7	1	0.2	5	0.5
20–29	10	1.8	10	2.3	20	2.1
30–39	19	3.5	19	4.4	38	3.9
40–49	72	13.3	47	10.9	119	12.2
50–59	173	31.9	105	24.2	278	28.5
60–69	145	26.8	128	29.6	273	28.0
70–79	83	15.3	86	19.9	169	17.3
80 +	36	6.6	37	8.5	73	7.5
All Age Groups	**542**	**100**	**433**	**100**	**975**	**100**

Figure 8.1.2.1.1 showed the trends in proportions of patients on dialysis from 1999 to 2013 by age group.

Figure 8.1.2.1.1: INCIDENT DIALYSIS PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80 +	2.8	4.0	3.9	3.7	4.6	3.5	4.1	5.2	5.0	5.3	4.0	6.6	6.1	6.2	7.5
70–79	14.0	13.4	12.6	13.9	14.2	16.1	19.2	19.3	18.2	16.1	19.5	17.7	19.7	20.7	17.3
60–69	25.2	23.1	31.2	25.5	24.3	25.4	24.7	27.7	27.0	30.8	30.1	31.3	29.2	30.4	28.0
50–59	22.9	27.2	22.5	28.5	29.8	27.5	26.4	26.1	28.6	26.6	25.7	27.8	26.8	24.6	28.5
40–49	17.5	18.8	19.5	18.6	18.8	18.8	17.8	13.6	13.8	12.9	13.1	11.2	11.8	11.8	12.2
30–39	12.7	10.7	6.6	6.3	5.7	5.6	4.4	5.5	4.6	6.5	4.4	3.4	4.3	3.1	3.9
20–29	3.5	2.1	2.7	2.6	1.6	1.9	2.1	1.4	1.4	1.4	1.9	1.6	1.6	2.1	2.1
0–19	1.3	1.0	1.0	0.8	0.9	1.1	1.4	1.2	1.3	0.4	1.2	0.4	0.4	1.0	0.5

8.1.2.2 Incident Dialysis Patients by Age Group and Modality

With the exception of age group 0 – 19 years, 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

2012 AGE GROUP	HD		PD		HD + PD	
	No	%	No	%	No	%
0–19	4	44.4	5	55.6	9	100
20–29	14	73.7	5	26.3	19	100
30–39	24	82.8	5	17.2	29	100
40–49	96	88.1	13	11.9	109	100
50–59	199	87.7	28	12.3	227	100
60–69	244	87.1	36	12.9	280	100
70–79	154	80.6	37	19.4	191	100
80 +	50	87.7	7	12.3	57	100
Total	**785**	**85.2**	**136**	**14.8**	**921**	**100**

2013 AGE GROUP	HD		PD		HD + PD	
	No	%	No	%	No	%
0–19	1	20.0	4	80.0	5	100
20–29	16	80.0	4	20.0	20	100
30–39	31	81.6	7	18.4	38	100
40–49	108	90.8	11	9.2	119	100
50–59	234	84.2	44	15.8	278	100
60–69	225	82.4	48	17.6	273	100
70–79	133	78.7	36	21.3	169	100
80 +	54	74.0	19	26.0	73	100
Total	**802**	**82.3**	**173**	**17.7**	**975**	**100**

8.1.2.3 Incident Dialysis Patients by Ethnic Group and Gender

In both years, the racial composition was similar to the racial distribution of the population. There was a male predominance in the Chinese but female predominance in the Malays for both years. For the Indians, males outnumbered the females in 2012 but in 2013, the converse was true.

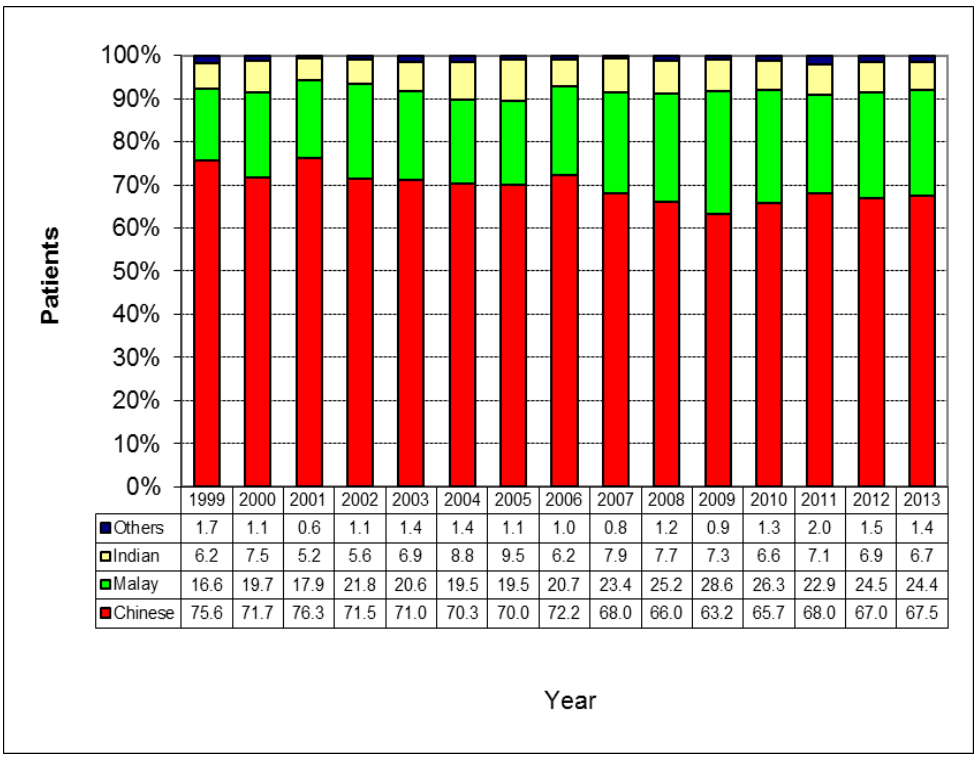
Table 8.1.2.3.1: INCIDENT DIALYSIS PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	359	70.0	258	63.2	617	67.0
Malay	108	21.1	118	28.9	226	24.5
Indian	39	7.6	25	6.1	64	6.9
Others	7	1.4	7	1.7	14	1.5
All Ethnic Groups	**513**	**100**	**408**	**100**	**921**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	399	73.6	259	59.8	658	67.5
Malay	105	19.4	133	30.7	238	24.4
Indian	27	5.0	38	8.8	65	6.7
Others	11	2.0	3	0.7	14	1.4
All Ethnic Groups	**542**	**100**	**433**	**100**	**975**	**100**

In the period 1999 – 2013, 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.

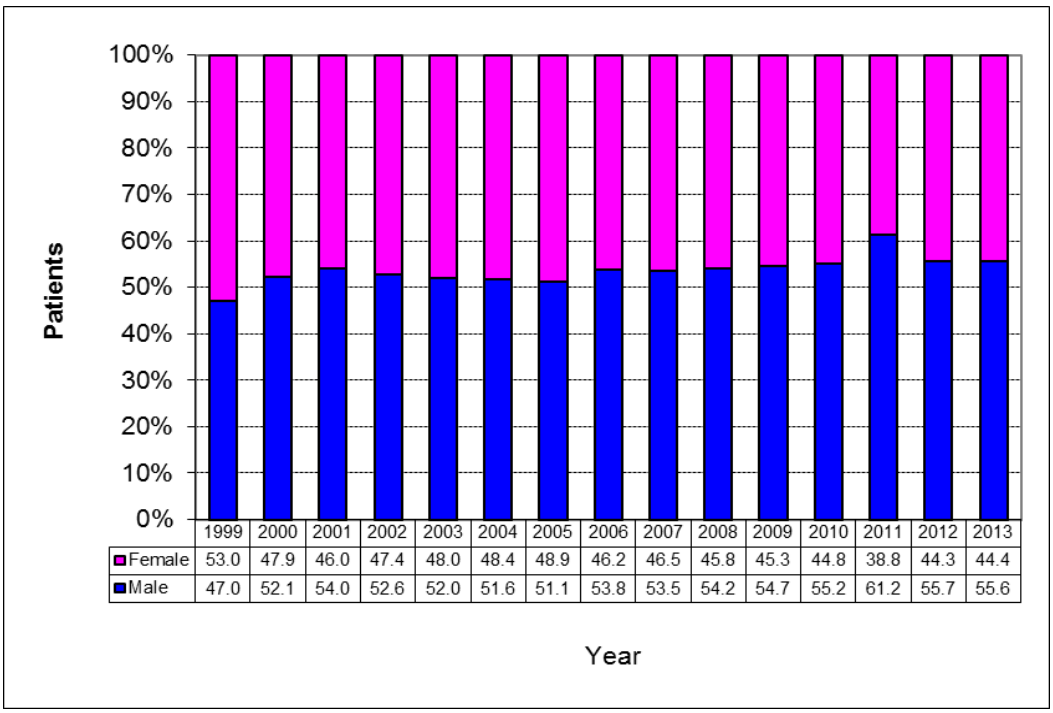
Figure 8.1.2.3.1: INCIDENT DIALYSIS PATIENTS BY ETHNIC GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.7	1.1	0.6	1.1	1.4	1.4	1.1	1.0	0.8	1.2	0.9	1.3	2.0	1.5	1.4
Indian	6.2	7.5	5.2	5.6	6.9	8.8	9.5	6.2	7.9	7.7	7.3	6.6	7.1	6.9	6.7
Malay	16.6	19.7	17.9	21.8	20.6	19.5	19.5	20.7	23.4	25.2	28.6	26.3	22.9	24.5	24.4
Chinese	75.6	71.7	76.3	71.5	71.0	70.3	70.0	72.2	68.0	66.0	63.2	65.7	68.0	67.0	67.5

With the exception of year 1999, the proportion of male dialysis patients was greater than that of the females for the period 1999 to 2013. See Figure 8.1.2.3.2.

Figure 8.1.2.3.2: INCIDENT DIALYSIS PATIENTS BY GENDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Female	53.0	47.9	46.0	47.4	48.0	48.4	48.9	46.2	46.5	45.8	45.3	44.8	38.8	44.3	44.4
Male	47.0	52.1	54.0	52.6	52.0	51.6	51.1	53.8	53.5	54.2	54.7	55.2	61.2	55.7	55.6

8.1.3 Prevalent Dialysis Patients

8.1.3.1 Prevalent Dialysis Patients by Age Group and Gender

There were 5,244 prevalent dialysis patients (CR 1,373.6 pmp; ASR 948.7 pmp) at the end of 2012 (Table 8.1.1.1). Of these, 54.6% were males. The proportion aged 60 years and above was 55.6% (Table 8.1.3.1.1).

At the end of 2013, there were 5,521 prevalent dialysis patients (CR 1,436.1 pmp, ASR 961.3 pmp). 55.0% of them were males; proportion aged 60 years and above was 56.8%.

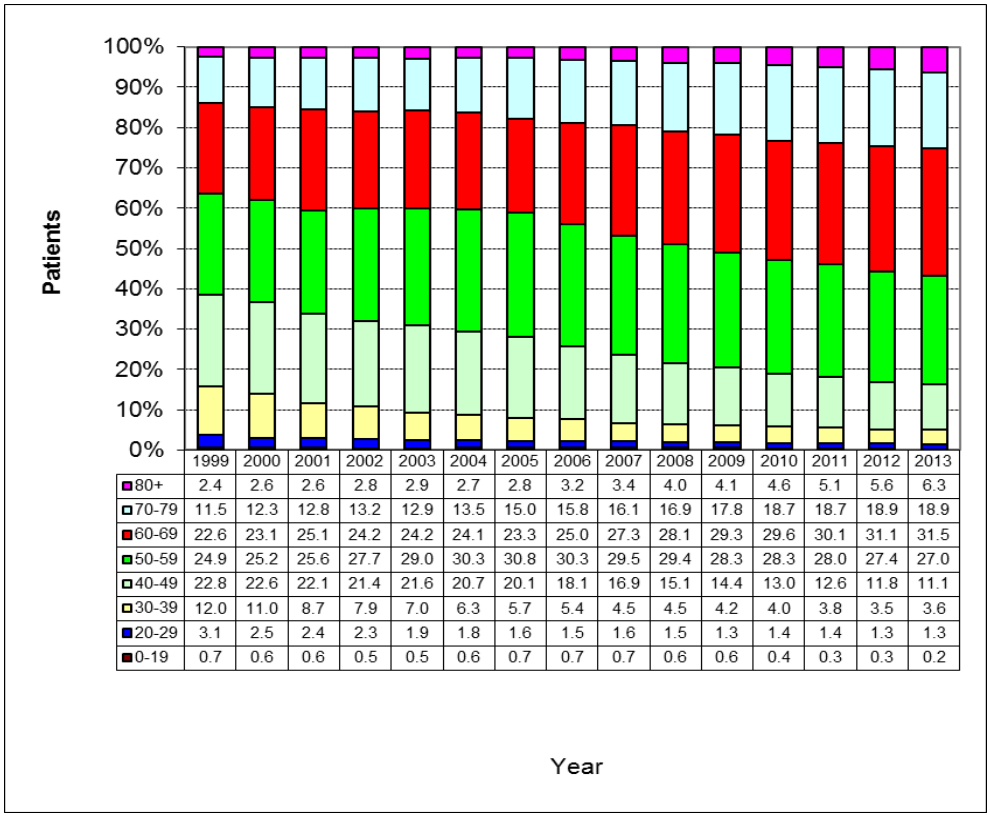
Table 8.1.3.1.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND GENDER

2012	Male		Female		Both Genders	
AGE GROUP	No	%	No	%	No	%
0–19	8	0.3	7	0.3	15	0.3
20–29	33	1.2	35	1.5	68	1.3
30–39	111	3.9	71	3.0	182	3.5
40–49	346	12.1	275	11.5	621	11.8
50–59	800	27.9	639	26.8	1439	27.4
60–69	938	32.8	695	29.2	1633	31.1
70–79	481	16.8	510	21.4	991	18.9
80 +	146	5.1	149	6.3	295	5.6
All Age Groups	**2863**	**100**	**2381**	**100**	**5244**	**100**

2013	Male		Female		Both Genders	
AGE GROUP	No	%	No	%	No	%
0–19	6	0.2	5	0.2	11	0.2
20–29	35	1.2	38	1.5	73	1.3
30–39	124	4.1	75	3.0	199	3.6
40–49	348	11.5	263	10.6	611	11.1
50–59	844	27.8	649	26.1	1493	27.0
60–69	989	32.6	750	30.2	1739	31.5
70–79	512	16.9	533	21.5	1045	18.9
80 +	179	5.9	171	6.9	350	6.3
All Age Groups	**3037**	**100**	**2484**	**100**	**5521**	**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 over the years. Notably, the proportion of dialysis patients aged 60 years and above increased from 36.5% in 1999 to 56.8% in 2013.

Figure 8.1.3.1.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80+	2.4	2.6	2.6	2.8	2.9	2.7	2.8	3.2	3.4	4.0	4.1	4.6	5.1	5.6	6.3
70-79	11.5	12.3	12.8	13.2	12.9	13.5	15.0	15.8	16.1	16.9	17.8	18.7	18.7	18.9	18.9
60-69	22.6	23.1	25.1	24.2	24.2	24.1	23.3	25.0	27.3	28.1	29.3	29.6	30.1	31.1	31.5
50-59	24.9	25.2	25.6	27.7	29.0	30.3	30.8	30.3	29.5	29.4	28.3	28.3	28.0	27.4	27.0
40-49	22.8	22.6	22.1	21.4	21.6	20.7	20.1	18.1	16.9	15.1	14.4	13.0	12.6	11.8	11.1
30-39	12.0	11.0	8.7	7.9	7.0	6.3	5.7	5.4	4.5	4.5	4.2	4.0	3.8	3.5	3.6
20-29	3.1	2.5	2.4	2.3	1.9	1.8	1.6	1.5	1.6	1.5	1.3	1.4	1.4	1.3	1.3
0-19	0.7	0.6	0.6	0.5	0.5	0.6	0.7	0.7	0.7	0.6	0.6	0.4	0.3	0.3	0.2

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% to 90%. See Table 8.1.3.2.1.

Table 8.1.3.2.1: PREVALENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY

2012 AGE GROUP	HD		PD		HD + PD	
	No	%	No	%	No	%
0–19	3	20.0	12	80.0	15	100
20–29	41	60.3	27	39.7	68	100
30–39	156	85.7	26	14.3	182	100
40–49	554	89.2	67	10.8	621	100
50–59	1304	90.6	135	9.4	1439	100
60–69	1442	88.3	191	11.7	1633	100
70–79	857	86.5	134	13.5	991	100
80 +	256	86.8	39	13.2	295	100
Total	**4613**	**88.0**	**631**	**12.0**	**5244**	**100**

2013 AGE GROUP	HD		PD		HD + PD	
	No	%	No	%	No	%
0–19	1	9.1	10	90.9	11	100
20–29	42	57.5	31	42.5	73	100
30–39	167	83.9	32	16.1	199	100
40–49	554	90.7	57	9.3	611	100
50–59	1334	89.4	159	10.6	1493	100
60–69	1538	88.4	201	11.6	1739	100
70–79	905	86.6	140	13.4	1045	100
80 +	299	85.4	51	14.6	350	100
Total	**4840**	**87.7**	**681**	**12.3**	**5521**	**100**

8.1.3.3 Prevalent Dialysis Patients by Ethnic Group and Gender

In 2012 and 2013, the racial composition was similar to the racial distribution of the population. There was a male predominance in the Chinese and the Indians but female predominance in the Malays for both years.

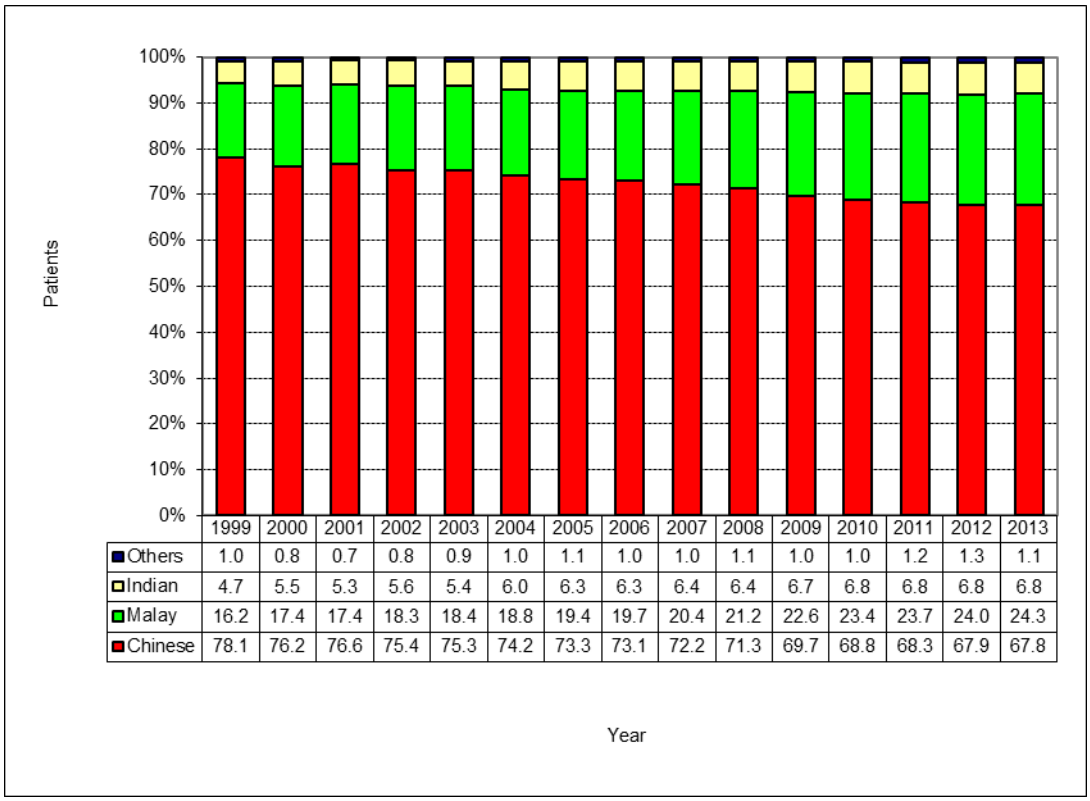
Table 8.1.3.3.1: PREVALENT DIALYSIS PATIENTS BY ETHNIC GROUP AND GENDER

2012	Male		Female		Both Genders	
ETHNIC GROUP	**No**	**%**	**No**	**%**	**No**	**%**
Chinese	2018	70.5	1541	64.7	3559	67.9
Malay	592	20.7	668	28.1	1260	24.0
Indian	220	7.7	138	5.8	358	6.8
Others	33	1.2	34	1.4	67	1.3
All Ethnic Groups	**2863**	**100**	**2381**	**100**	**5244**	**100**

2013	Male		Female		Both Genders	
ETHNIC GROUP	**No**	**%**	**No**	**%**	**No**	**%**
Chinese	2158	71.1	1583	63.7	3741	67.8
Malay	627	20.6	715	28.8	1342	24.3
Indian	216	7.1	160	6.4	376	6.8
Others	36	1.2	26	1.0	62	1.1
All Ethnic Groups	**3037**	**100**	**2484**	**100**	**5521**	**100**

As in incident dialysis patients, the racial composition was similar to the racial distribution of the population for both years. See Figure 8.1.3.3.1. The proportion of Chinese has been dropping from 78.1% in 1999 to 67.8% in 2013. During this time, the proportions of Indians (4.7% in 1999 to 6.8% in 2013) and Malays (16.2% in 1999 to 24.3% in 2013) have increased.

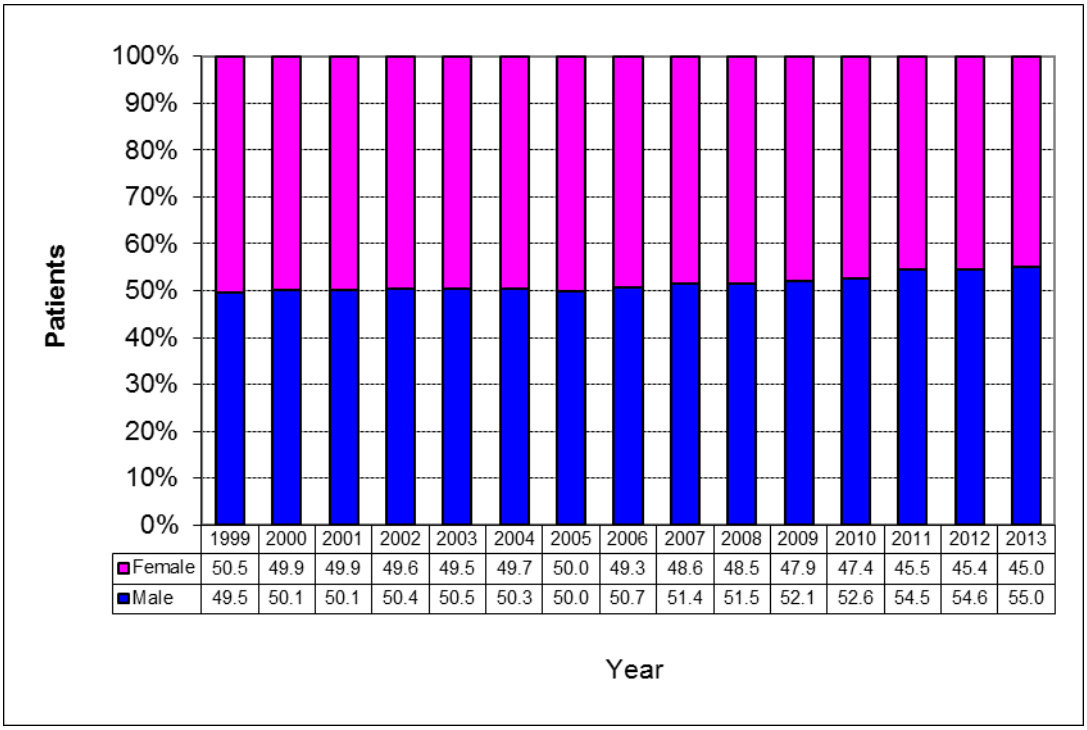
Figure 8.1.3.3.1: PREVALENT DIALYSIS PATIENTS BY ETHNIC GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.0	0.8	0.7	0.8	0.9	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.2	1.3	1.1
Indian	4.7	5.5	5.3	5.6	5.4	6.0	6.3	6.3	6.4	6.4	6.7	6.8	6.8	6.8	6.8
Malay	16.2	17.4	17.4	18.3	18.4	18.8	19.4	19.7	20.4	21.2	22.6	23.4	23.7	24.0	24.3
Chinese	78.1	76.2	76.6	75.4	75.3	74.2	73.3	73.1	72.2	71.3	69.7	68.8	68.3	67.9	67.8

In 1999, the proportion of prevalent dialysis patients was slightly higher in females. However, 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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Female	50.5	49.9	49.9	49.6	49.5	49.7	50.0	49.3	48.6	48.5	47.9	47.4	45.5	45.4	45.0
Male	49.5	50.1	50.1	50.4	50.5	50.3	50.0	50.7	51.4	51.5	52.1	52.6	54.5	54.6	55.0

8.1.4 Mortality

There were 653 dialysis deaths (CR 171.0 pmp; ASR 115.2 pmp) in 2012. (Table 8.1.1.1) Of these deaths, 530 of them (CR 138.8 pmp; ASR 93.4 pmp) were on HD (Table 8.7.1.1) and 123 (CR 32.2 pmp; ASR 21.8 pmp) were on PD prior to their demise. (Table 8.8.1.1) Mortality is further discussed in Section 8.9.

In 2013, there were 663 dialysis deaths (CR 175.0 pmp; ASR 120.8 pmp). (Table 8.1.1.1) Of these deaths, 654 of them (CR 170.1 pmp; ASR 110.4 pmp) were on HD (Table 8.7.1.1) and 117 (CR 30.4 pmp; ASR 20.0 pmp) were on PD prior to their demise. (Table 8.8.1.1)

8.2 Aetiology of Renal Failure

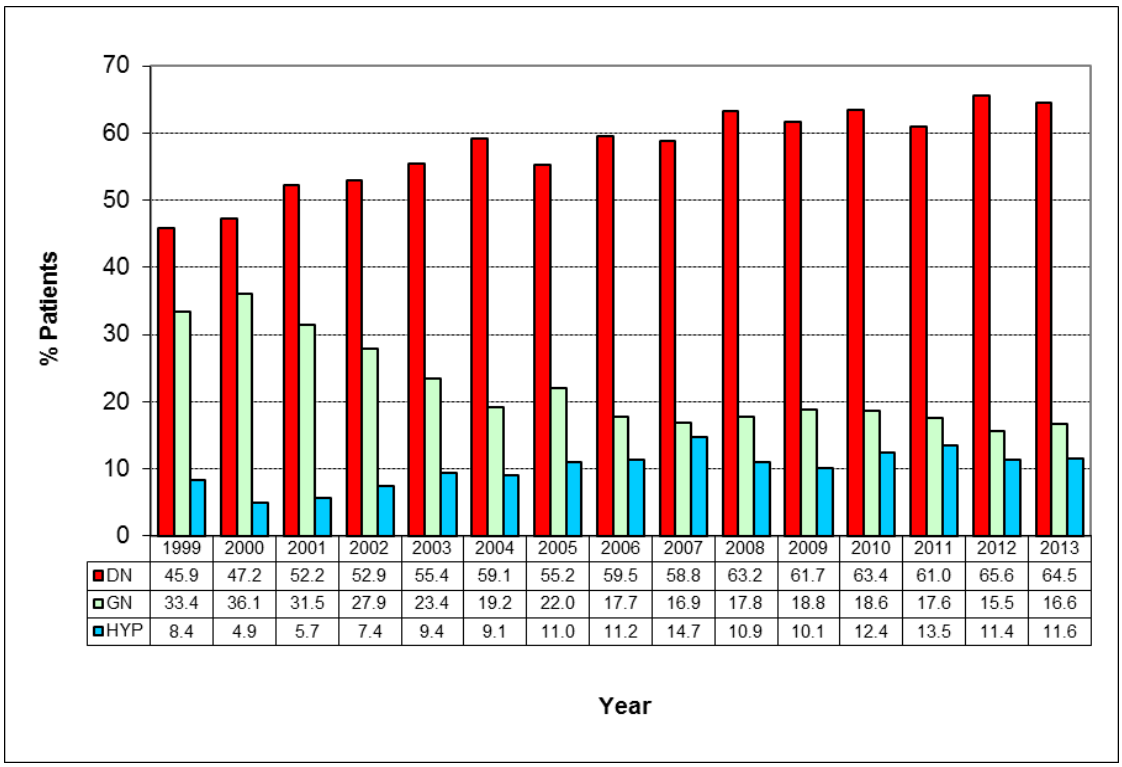
8.2.1 Incident Patients

The most common cause of end-stage renal failure was DN (65.6% in 2012, 65.0% in 2013), followed by primary GN (15.5% in 2012, 16.0% in 2013) (Table 8.2.1.1).

Table 8.2.1.1: INCIDENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE

Cause of CKD5	2012		2013	
	No	%	No	%
Diabetic Nephropathy	604	65.6	634	65.0
Primary Glomerulonephritis (GN)	143	15.5	156	16.0
Autoimmune Disease/GN with Systemic Manifestations	14	1.5	10	1.0
Hypertension and Renovascular Disease	105	11.4	114	11.7
Polycystic Kidney Disease / Other Cystic Diseases	21	2.3	31	3.2
Vesicoureteric Reflex / Chronic Pyelonephritis	0	0.0	2	0.2
Obstruction	9	1.0	11	1.1
Stone Disease	1	0.1	0	0.0
Miscellaneous	20	2.2	15	1.5
Unknown	4	0.4	2	0.2
All Causes	**921**	**100**	**975**	**100**

Figure 8.2.1.1: INCIDENT DIALYSIS PATIENTS BY AETIOLOGY (DIABETIC NEPHROPATHY, PRIMARY GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE), 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DN	45.9	47.2	52.2	52.9	55.4	59.1	55.2	59.5	58.8	63.2	61.7	63.4	61.0	65.6	64.5
GN	33.4	36.1	31.5	27.9	23.4	19.2	22.0	17.7	16.9	17.8	18.8	18.6	17.6	15.5	16.6
HYP	8.4	4.9	5.7	7.4	9.4	9.1	11.0	11.2	14.7	10.9	10.1	12.4	13.5	11.4	11.6

Among the 143 cases of primary GN in 2012, 41.3% (59 out of 143) were biopsy-proven. Among the 156 cases of primary GN in 2013, 35.3% (55 out of 156) 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 GN are shown in Table 8.2.1.2.

IgA Nephropathy was the most common biopsy-proven GN in 2013 (25.0%, 39 out of 55).

Systemic Lupus Erythematosus comprised 85.7% of secondary GN in 2012 and 90.0% in 2013. It also made up 7.6% (12 out of157) of all GN (primary and secondary) in 2012 and 5.4% (9 out of 166) in 2013.

Table 8.2.1.2: INCIDENT DIALYSIS PATIENTS BY GLOMERULONEPHRITIS

GLOMERULONEPHRITIS	2012		2013	
	No	%	No	%
Primary Glomerulonephritis (No Biopsy)				
Presumed Glomerulonephritis	**84**	**58.7**	**101**	**61.7**
Primary Glomerulonephritis (with Biopsy)				
Histology undefinable; advanced	1	0.7	1	0.6
Focal sclerosing Glomerulonephritis	25	17.5	11	7.1
IgA Nephropathy	21	14.7	39	25.0
Crescentric GN (otherwise not specified): RPGN	3	2.1	2	1.3
Membranous (epimembranous) Glomerulonephritis	5	3.5	0	0.0
Focal segmental proliferative (include focal necrosis)	0	0.0	1	0.6
IgM Nephropathy	1	0.7	1	0.6
Mesangial proliferative (non IgA)	1	0.7	0	0.0
Sub-total Primary Glomerulonephritis (with Biopsy)	**59**	**41.3**	**55**	**35.3**
Total Primary Glomerulonephritis	**143**	**100**	**156**	**100**
Secondary Glomerulonephritis				
Systemic Lupus Erythematosus	12	85.7	9	90.0
ANCA positive GN	1	7.1	0	0.0
Wegener (extra renal granuloma proven)	0	0.0	1	10.0
Henoch-Scholein GN	1	7.1	0	0.0
Total Secondary Glomerulonephritis	**14**	**100**	**10**	**100**
All Glomerulonephritis	**157**	**17.0**	**166**	**17.0**
All Biopsy proven Glomerulonephritis	**73**	**7.9**	**65**	**6.7**
All ESRD	**921**		**975**	

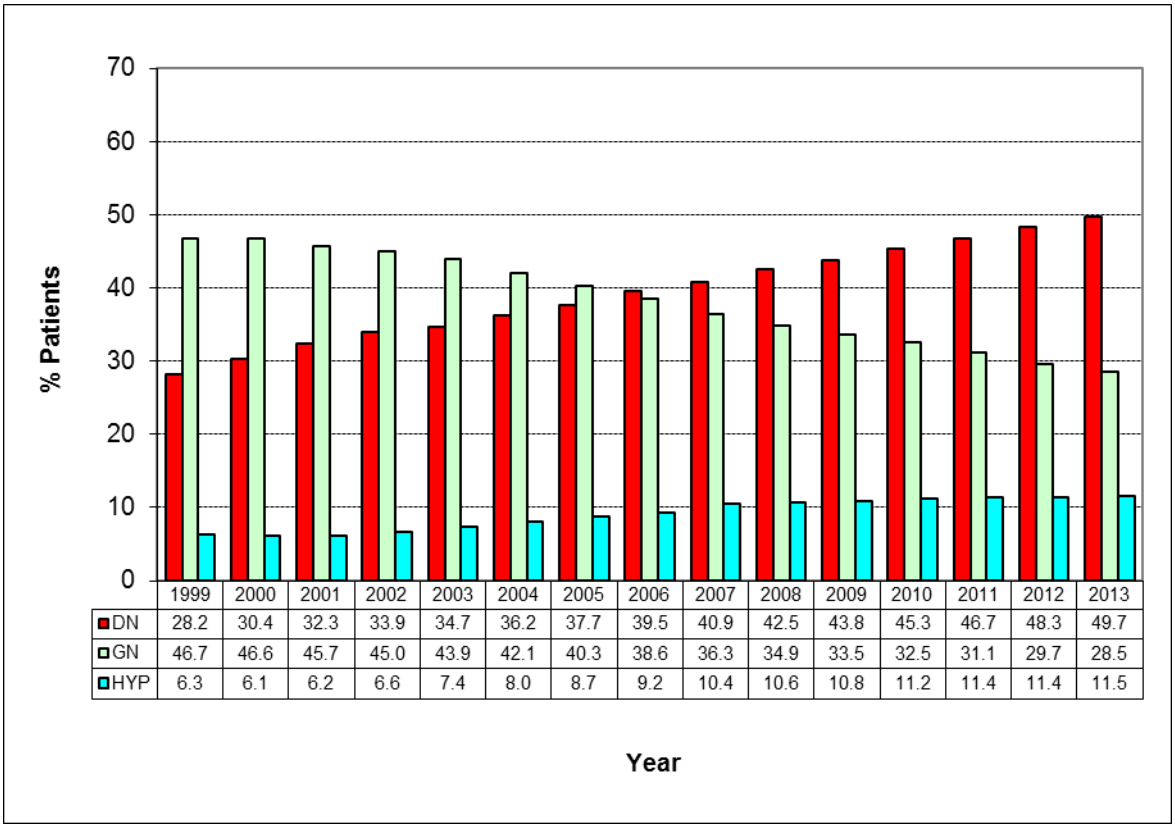
8.2.2 Prevalent Patients

The commonest overall cause of CKD5 in the existing dialysis population in 2012 and 2013 was DN at 48.3% and 49.7% respectively. Primary GN comprised 29.7% in 2012 and 28.5% in 2013.

Table 8.2.2.1: PREVALENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE

Cause of CKD5	2012		2013	
	No	%	No	%
Diabetic Nephropathy	2533	48.3	2744	49.7
Primary Glomerulonephritis (GN)	1555	29.7	1574	28.5
Autoimmune Disease/GN with Systemic Manifestations	116	2.2	114	2.1
Hypertension and Renovascular Disease	598	11.4	637	11.5
Polycystic Kidney Disease / Other Cystic Diseases	162	3.1	183	3.3
Vesicoureteric Reflex / Chronic Pyelonephritis	26	0.5	25	0.5
Obstruction	49	0.9	55	1.0
Stone Disease	14	0.3	12	0.2
Miscellaneous	117	2.2	110	2.0
Unknown	74	1.4	67	1.2
All Causes	**5244**	**100**	**5521**	**100**

Figure 8.2.2.1: PREVALENT DIALYSIS PATIENTS BY AETIOLOGY (DIABETIC NEPHROPATHY, PRIMARY GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE), 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DN	28.2	30.4	32.3	33.9	34.7	36.2	37.7	39.5	40.9	42.5	43.8	45.3	46.7	48.3	49.7
GN	46.7	46.6	45.7	45.0	43.9	42.1	40.3	38.6	36.3	34.9	33.5	32.5	31.1	29.7	28.5
HYP	6.3	6.1	6.2	6.6	7.4	8.0	8.7	9.2	10.4	10.6	10.8	11.2	11.4	11.4	11.5

The proportion of patients with DN increased through the years from 1999 to 2013, while the proportion with primary GN decreased through the years in the same time period.

Among the 1,555 cases of primary GN in 2012, 1,109 cases (71.3%) were not biopsy-proven. Among the 1,574 cases of primary GN in 2013, 1098 cases (69.8%) were not biopsy-proven.

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

In 2012, IgA Nephropathy represented 53.4% (238 out of 446) of biopsy-proven primary GN while this was 55.5% (264 out of 476) in 2013. Histologically undefinable or inconclusive cases comprised 8.1% (36 out of 446) in 2012 and 7.1% (34 out of 476) in 2013 of biopsy-proven primary GN. Systemic Lupus Erythematosus comprised 83.6% (97 out of 116) of secondary GN or 5.8% (97 out of1671) of all GN in 2010. In 2013, the corresponding figures were 84.2% (96 out of 114) of secondary GN or 5.7% (96 out of 1688) of all GN.

Table 8.2.2.2: PREVALENT DIALYSIS PATIENTS BY BIOPSY- PROVEN GLOMERULONEPHRITIS

GLOMERULONEPHRITIS	2012		2013	
	No	%	No	%
Primary Glomerulonephritis (No Biopsy)				
Presumed Glomerulonephritis	**1109**	**71.3**	**1098**	**69.8**
Primary Glomerulonephritis (with Biopsy)				
Histology undefinable; advanced	36	2.3	34	2.2
Focal sclerosing Glomerulonephritis	117	7.5	122	7.8
IgA Nephropathy	238	15.3	264	16.8
Mesangiocapillary/membranoproliferative Type I (DDD)	2	0.1	2	0.1
Membranous (epimembranous) Glomerulonephritis	18	1.2	19	1.2
Cresentic GN (otherwise not specified): RPGN	14	0.9	13	0.8
Mesangial proliferative (non IgA)	9	0.6	8	0.5
Mesangial proliferative no IMF	1	0.1	1	0.1
Focal segmental proliferative (include focal necrosis)	1	0.1	2	0.1
GN: Minimal lesion	2	0.1	2	0.1
IgM Nephropathy	8	0.5	9	0.6
Sub-total Primary Glomerulonephritis (with Biopsy)	**446**	**28.7**	**476**	**30**
Total Primary Glomerulonephritis	**1555**	**100**	**1574**	**100**
Secondary Glomerulonephritis				
Henoch-Schonlein Glomerulonephritis	6	5.2	6	5.3
Goodpastures (anti-GBM with lung involvement)	6	5.2	6	5.3
Systemic Lupus Erythematosus	97	83.6	96	84.2
Wegener (extra renal granuloma proven)	1	0.9	1	0.9
ANCA positive GN	4	3.4	3	2.6
HIV Nephropathy	1	0.9	1	0.9
HBsAG associated GN	1	0.9	1	0.9
Total Secondary Glomerulonephritis	**116**	**100**	**114**	**100**
All Glomerulonephritis	**1671**	**31.9**	**1688**	**30.6**
All Biopsy proven Glomerulonephritis	**562**	**10.7**	**590**	**10.7**
All ESRD	**5244**		**5521**	

Miscellaneous causes of renal failure for 2012 and 2013 are listed in Table 8.2.2.3.

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

Miscellaneous Causes of Renal Failure	2012		2013	
	No	%	No	No
Amyloid glomerulopathy	1	0.9	4	3.6
Drug induced glomerulopathy incl heroin	3	2.6	3	2.7
Alport's disease (classical)	4	3.4	4	3.6
Analgesic nephropathy	13	11.1	11	10.0
Drug-induced interstitial nephrtis	1	0.9	1	0.9
Bladder neck obstruction (include prostatomegaly)	1	0.9	1	0.9
Congenital obstructive uropathy renal tract anomaly (unspecified)	3	2.6	4	3.6
Posterior urethral valves (obstructive nephropathy)	7	6.0	7	6.4
PUJ obstruction	1	0.9	1	0.9
Renal anomaly with spina bifida/myelomeningocoele	1	0.9	1	0.9
Renal hypoplasia/dysplasia/agenesis	14	12.0	13	11.8
Neuropathic bladder (congenital or acquired)	9	7.7	8	7.3
Renal TB	2	1.7	3	2.7
Interstitial nephritis (otherwise unspecified)	3	2.6	3	2.7
Cholesterol emboli	1	0.9	1	0.9
Renal cell carcinoma	5	4.3	4	3.6
Paraproteinemia (include multiple myeloma)	7	6.0	3	2.7
Diagnosis not listed (specify)	41	35.0	38	34.5
Total	**117**	**100**	**110**	**100**

8.3 Modality

8.3.1 Incident Patients

In 2012, 785 patients (CR 205.6 pmp; ASR 143.0 pmp) started on HD compared with 802 patients (CR 208.6 pmp; ASR 139.6 pmp) in 2013. There were 136 new PD patients (CR 35.6 pmp; ASR 26.3 pmp) in 2012 compared with 173 patients (CR 45.0 pmp; ASR 30.8 pmp) in 2013. (Table 8.3.1.1)

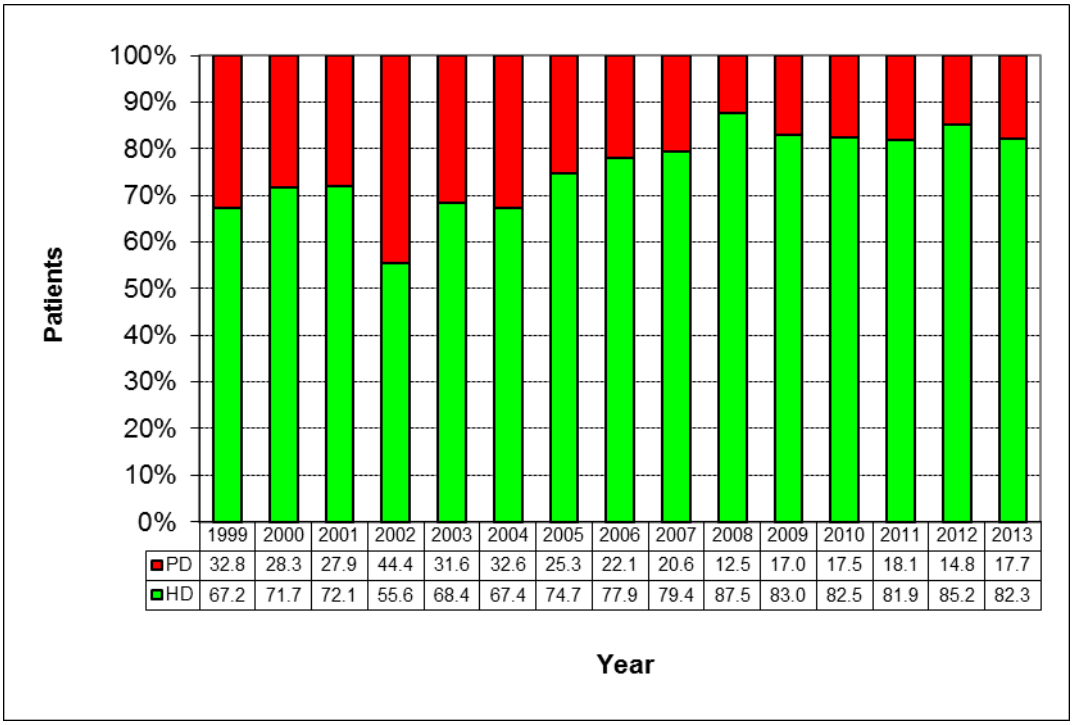
Table 8.3.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY

MODALITY	2012				2013			
	No	%	CR*	ASR*	No	%	CR*	ASR*
HD	785	85.2	205.6	143.0	802	82.3	208.6	139.6
PD	136	14.8	35.6	26.3	173	17.7	45.0	30.8
HD+PD	**921**	**100**	**241.2**	**169.3**	**975**	**100**	**253.6**	**170.4**

* per million resident population

Between 1999 and 2013, there were transiently more new patients started on PD in 2002 (44.4%) as compared with around 20% in other years.

Figure 8.3.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY, 1999 – 2013



The proportion of patients aged 60 years and above was 57.1% for those on HD and 58.8% for PD in 2012. The proportion of patients aged 60 years and above was 51.4% for those on HD and 59.5% for PD in 2013 (Table 8.3.1.2).

Table 8.3.1.2: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND MODALITY

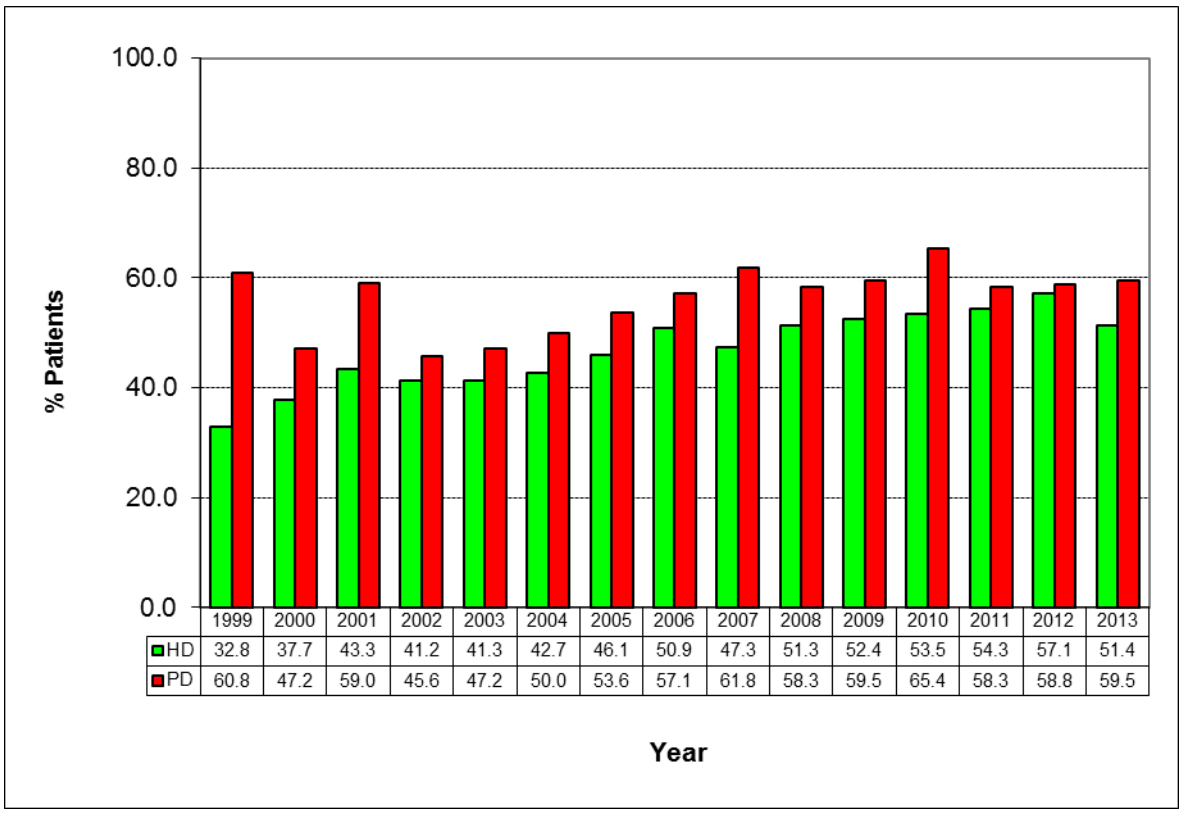
2012 AGE GROUP	HD			PD			HD+PD		
	No	%	CR	No	%	CR	No	%	CR
0–19	4	0.5	4.5	5	3.7	5.6	9	1.0	10.2
20–29	14	1.8	27.0	5	3.7	9.6	19	2.1	36.6
30–39	24	3.1	39.4	5	3.7	8.2	29	3.1	47.6
40–49	96	12.2	152.5	13	9.6	20.6	109	11.8	173.1
50–59	199	25.4	341.8	28	20.6	48.1	227	24.6	389.9
60–69	244	31.1	711.8	36	26.5	105.0	280	30.4	816.8
70–79	154	19.6	895.3	37	27.2	215.1	191	20.7	1110.5
80 +	50	6.4	644.3	7	5.1	90.2	57	6.2	734.5
All Age Groups	**785**	**100**	**205.6**	**136**	**100**	**35.6**	**921**	**100**	**241.2**

2013 AGE GROUP	HD			PD			HD+PD		
	No	%	CR	No	%	CR	No	%	CR
0–19	1	0.1	1.1	4	2.3	4.6	5	0.5	5.7
20–29	16	2.0	30.6	4	2.3	7.7	20	2.1	38.3
30–39	31	3.9	51.5	7	4.0	11.6	38	3.9	63.1
40–49	108	13.5	171.8	11	6.4	17.5	119	12.2	189.2
50–59	234	29.2	394.0	44	25.4	74.1	278	28.5	468.1
60–69	225	28.1	611.2	48	27.7	130.4	273	28.0	741.6
70–79	133	16.6	755.3	36	20.8	204.4	169	17.3	959.7
80 +	54	6.7	657.7	19	11.0	231.4	73	7.5	889.2
All Age Groups	**802**	**100**	**208.6**	**173**	**100**	**45.0**	**975**	**100**	**253.6**

* per million resident population

The proportion of patients on HD aged 60 years and above was 57.1% in 2012 and 51.4% in 2011. The proportion of patients on PD aged 60 years and above was 58.8% in 2012 and 59.5% in 2013 (Table 8.3.1.2).

Figure 8.3.1.2: INCIDENT PATIENTS AGED 60 YEARS AND ABOVE BY MODALITY, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD	32.8	37.7	43.3	41.2	41.3	42.7	46.1	50.9	47.3	51.3	52.4	53.5	54.3	57.1	51.4
PD	60.8	47.2	59.0	45.6	47.2	50.0	53.6	57.1	61.8	58.3	59.5	65.4	58.3	58.8	59.5

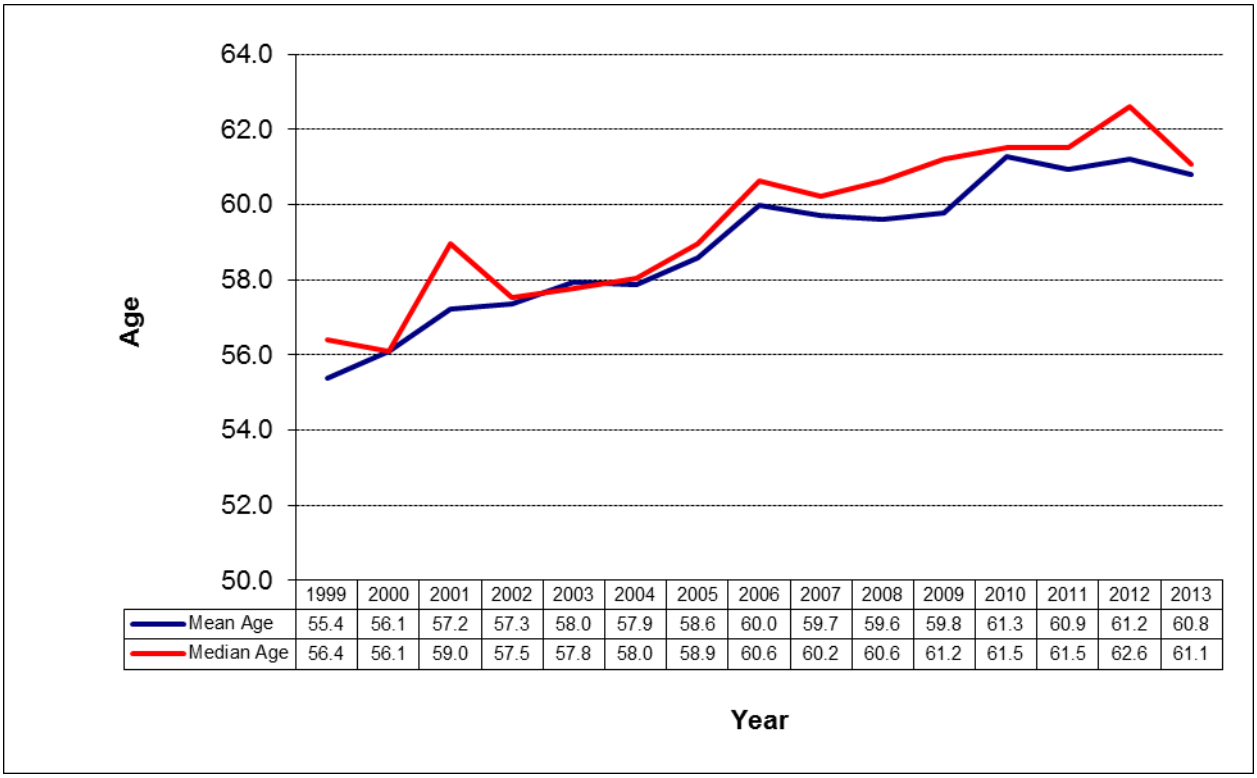
In 2012, the mean age of incident PD patients was 1 year younger than the incident HD patients (60.4 (median: 64.6) years versus 61.4 (median: 62.3) years respectively). The gap increased to 2 years in 2013 where the mean age of PD patients was 62.3 (median: 65.2) years compared with 60.5 (median: 60.6) years in HD patients (Table 8.3.1.3).

Table 8.3.1.3: AGE OF INCIDENT PATIENTS BY MODALITY

MODALITY	2012			2013		
	Mean Age	Median Age	Std Dev	Mean Age	Median Age	Std Dev
HD	61.4	62.3	13.1	60.5	60.6	12.9
PD	60.4	64.6	16.3	62.3	65.2	15.6
HD+PD	**61.2**	**62.6**	**13.6**	**60.8**	**61.1**	**13.4**

The mean age of all incident patients on dialysis increased from 55.4 years old in 1999 to 60.8 years old in 2013. See Figure 8.3.1.3.

Figure 8.3.1.3: AGE OF INCIDENT DIALYSIS PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mean Age	55.4	56.1	57.2	57.3	58.0	57.9	58.6	60.0	59.7	59.6	59.8	61.3	60.9	61.2	60.8
Median Age	56.4	56.1	59.0	57.5	57.8	58.0	58.9	60.6	60.2	60.6	61.2	61.5	61.5	62.6	61.1

In 2012, 64.7% of new patients who went on to PD had DN compared with 65.7% in HD patients. There were more new HD patients with primary GN than new PD patients (15.7% vs 14.7% respectively) (Table 8.3.1.4).

The trend in 2013 was similar: 63.0% of new PD patients had DN compared with 64.8% of HD patients. The proportion of patients with primary GN was higher in PD patients than HD patients (20.2% vs 15.8% respectively) (Table 8.3.1.4).

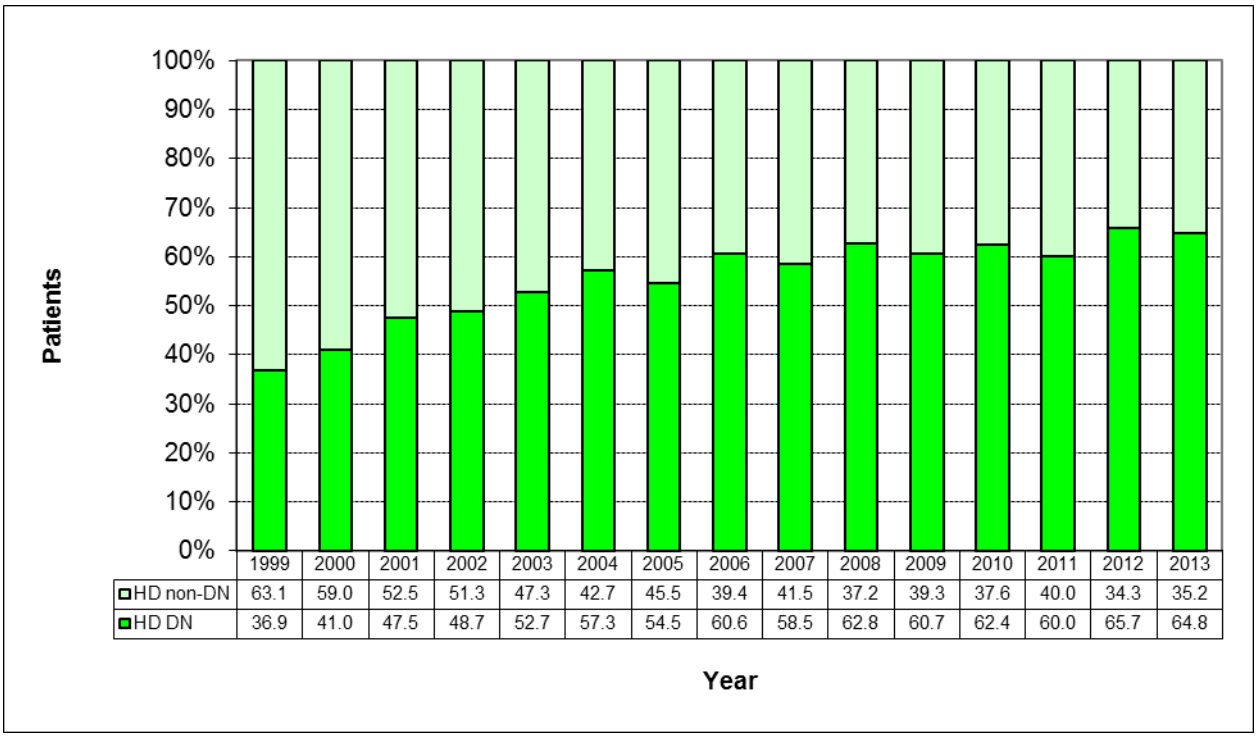
Table 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE AND MODALITY

Causes of CKD5	2012				2013			
	HD		PD		HD		PD	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy (DN)	516	65.7	88	64.7	520	64.8	109	63.0
Primary Glomerulonephritis (GN)	123	15.7	20	14.7	127	15.8	35	20.2
Autoimmune Disease/GN with Systemic Manifestations	12	1.5	2	1.5	9	1.1	1	0.6
Hypertension and Renovascular Disease	85	10.8	20	14.7	92	11.5	21	12.1
Polycystic Kidney Disease / Other Cystic Diseases	21	2.7	0	0.0	26	3.2	5	2.9
Vesicoureteric Reflex / Chronic Pyelonephritis	0	0.0	0	0.0	2	0.2	0	0.0
Obstruction	9	1.1	0	0.0	10	1.2	1	0.6
Stone Disease	1	0.1	0	0.0	0	0.0	0	0.0
Miscellaneous	16	2.0	4	2.9	14	1.7	1	0.6
Unknown	2	0.3	2	1.5	2	0.2	0	0.0
All Causes	**785**	**100**	**136**	**100**	**802**	**100**	**173**	**100**

The proportion of incident HD patients with DN increased from 36.9% in 1999 to 64.8% in 2013. DN was the etiology of CKD5 in approximately two thirds of incident PD patients from 1999 to 2013. See Figure 8.3.1.4.

Figure 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2013

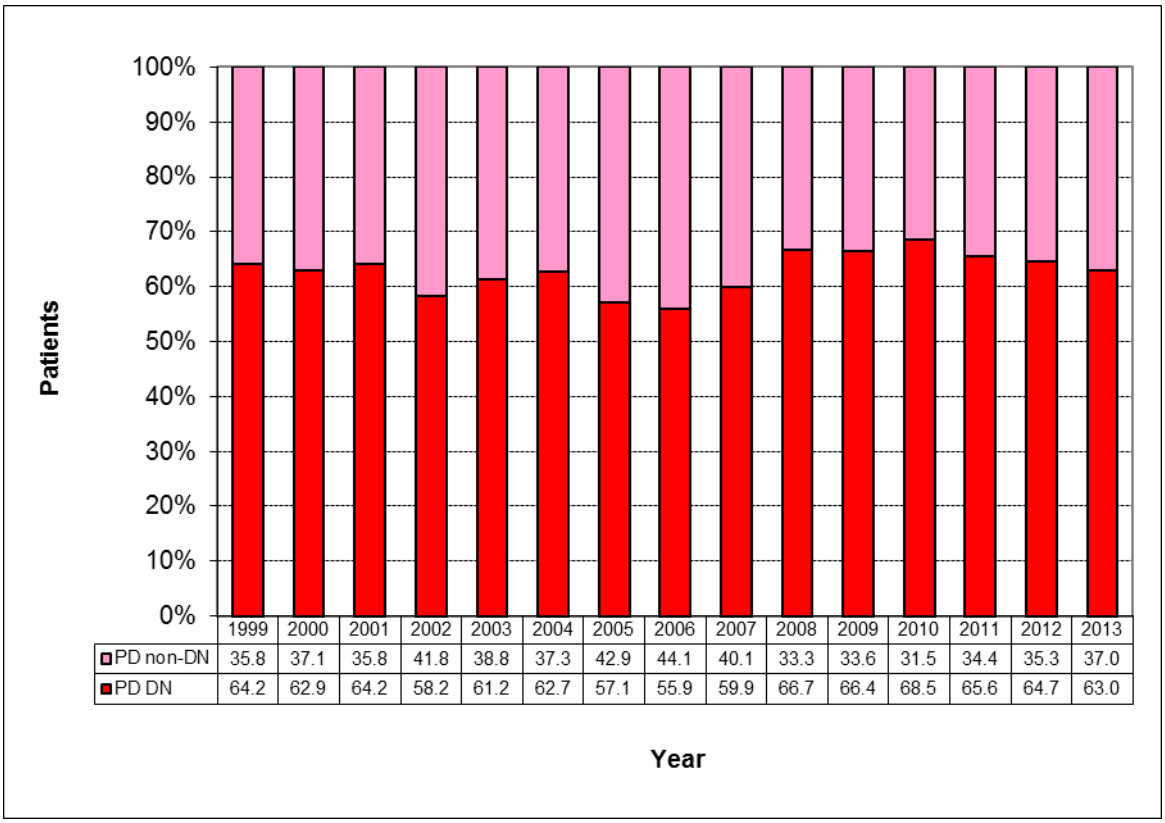
(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-DN	63.1	59.0	52.5	51.3	47.3	42.7	45.5	39.4	41.5	37.2	39.3	37.6	40.0	34.3	35.2
HD DN	36.9	41.0	47.5	48.7	52.7	57.3	54.5	60.6	58.5	62.8	60.7	62.4	60.0	65.7	64.8

Figure 8.3.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2013

(b) Peritoneal Dialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-DN	35.8	37.1	35.8	41.8	38.8	37.3	42.9	44.1	40.1	33.3	33.6	31.5	34.4	35.3	37.0
PD DN	64.2	62.9	64.2	58.2	61.2	62.7	57.1	55.9	59.9	66.7	66.4	68.5	65.6	64.7	63.0

8.3.2 Prevalent Patients

As of 31 December 2012, there were 5,244 patients (CR 1,373.6 pmp; ASR 948.7 pmp) on dialysis, of whom 4,613 (CR 1208.3 pmp; ASR 828.8 pmp) were on HD and 631 (CR 165.3 pmp; ASR 119.9 pmp) were on PD. This trend was similar for 2013. As of 31 December 2013, there were 5,521 patients (CR 1,436.1 pmp; ASR 961.3 pmp) on dialysis, of whom 4,840 (CR 1,259.0 pmp; ASR 837.5 pmp) were on HD and 681 (CR 177.1 pmp; ASR 123.7 pmp) were on PD.

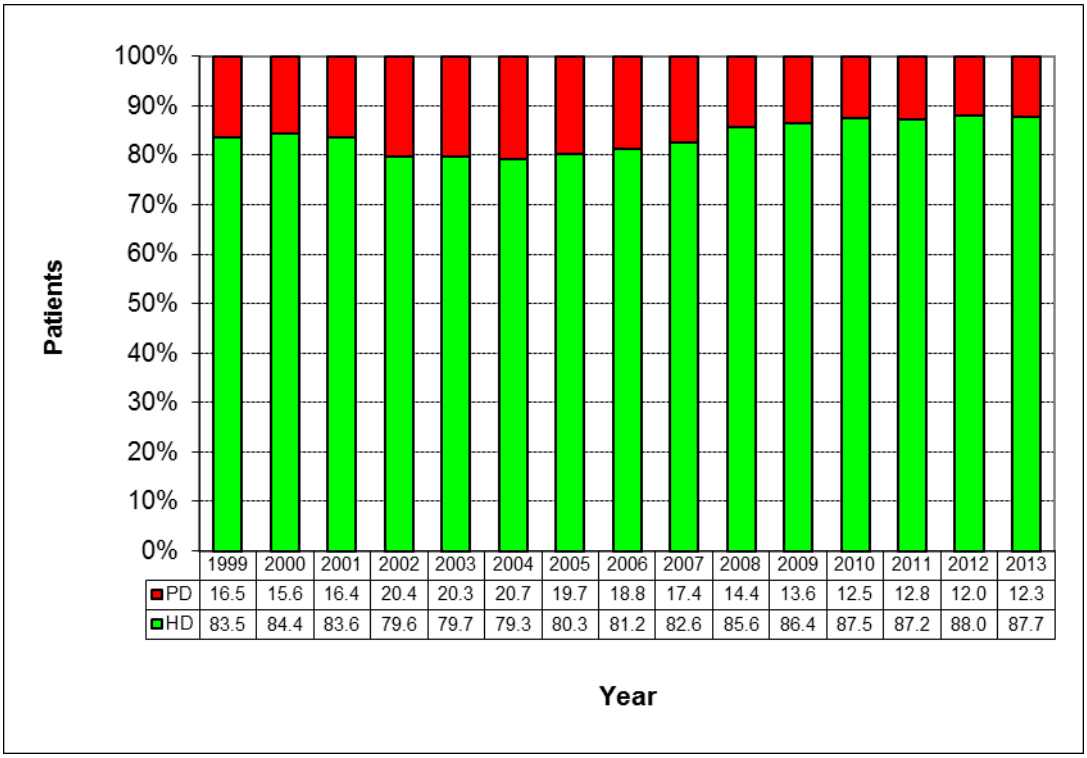
Table 8.3.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY

MODALITY	2012				2013			
	No	%	CR*	ASR*	No	%	CR*	ASR*
HD	4613	88.0	1208.3	828.8	4840	87.7	1259.0	837.5
PD	631	12.0	165.3	119.9	681	12.3	177.1	123.7
HD+PD	**5244**	**100**	**1373.6**	**948.7**	**5521**	**100**	**1436.1**	**961.3**

* per million resident population

An increasing trend of prevalent patients was observed from 1999 till 2013. Prevalent PD patients formed 12.3% of the total dialysis population in 2013. See Table 8.3.2.1.

Figure 8.3.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY, 1999 – 2013



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

2012 AGE GROUP	HD			PD			HD+PD		
	No	%	CR*	No	%	CR*	No	%	CR*
0–19	3	0.1	3.4	12	1.9	13.6	15	0.3	16.9
20–29	41	0.9	79.0	27	4.3	52.0	68	1.3	131.0
30–39	156	3.4	256.1	26	4.1	42.7	182	3.5	298.8
40–49	554	12.0	879.8	67	10.6	106.4	621	11.8	986.2
50–59	1304	28.3	2239.8	135	21.4	231.9	1439	27.4	2471.7
60–69	1442	31.3	4206.5	191	30.3	557.2	1633	31.1	4763.7
70–79	857	18.6	4982.6	134	21.2	779.1	991	18.9	5761.6
80 +	256	5.5	3299.0	39	6.2	502.6	295	5.6	3801.5
All Age Groups	**4613**	**100**	**1208.3**	**631**	**100**	**165.3**	**5244**	**100**	**1373.6**

2013 AGE GROUP	HD			PD			HD+PD		
	No	%	CR*	No	%	CR*	No	%	CR*
0–19	1	0.0	1.1	10	1.5	11.5	11	0.2	12.6
20–29	42	0.9	80.4	31	4.6	59.3	73	1.3	139.7
30–39	167	3.5	277.2	32	4.7	53.1	199	3.6	330.3
40–49	554	11.4	881.0	57	8.4	90.6	611	11.1	971.7
50–59	1334	27.6	2246.2	159	23.3	267.7	1493	27.0	2513.9
60–69	1538	31.8	4178.2	201	29.5	546.0	1739	31.5	4724.3
70–79	905	18.7	5139.1	140	20.6	795.0	1045	18.9	5934.1
80 +	299	6.2	3641.9	51	7.5	621.2	350	6.3	4263.1
All Age Groups	**4840**	**100**	**1259.0**	**681**	**100**	**177.1**	**5521**	**100**	**1436.1**

* per million resident population

In 2012, the proportion of patients on HD aged 60 years and above was 55.4% compared with 57.7% for those on PD. See Table 8.3.2.2. The mean age of the patient on HD was 61.4 years (median 61.6 years) while for PD, this was 60.2 years (median 63.1 years). See Table 8.3.2.3.

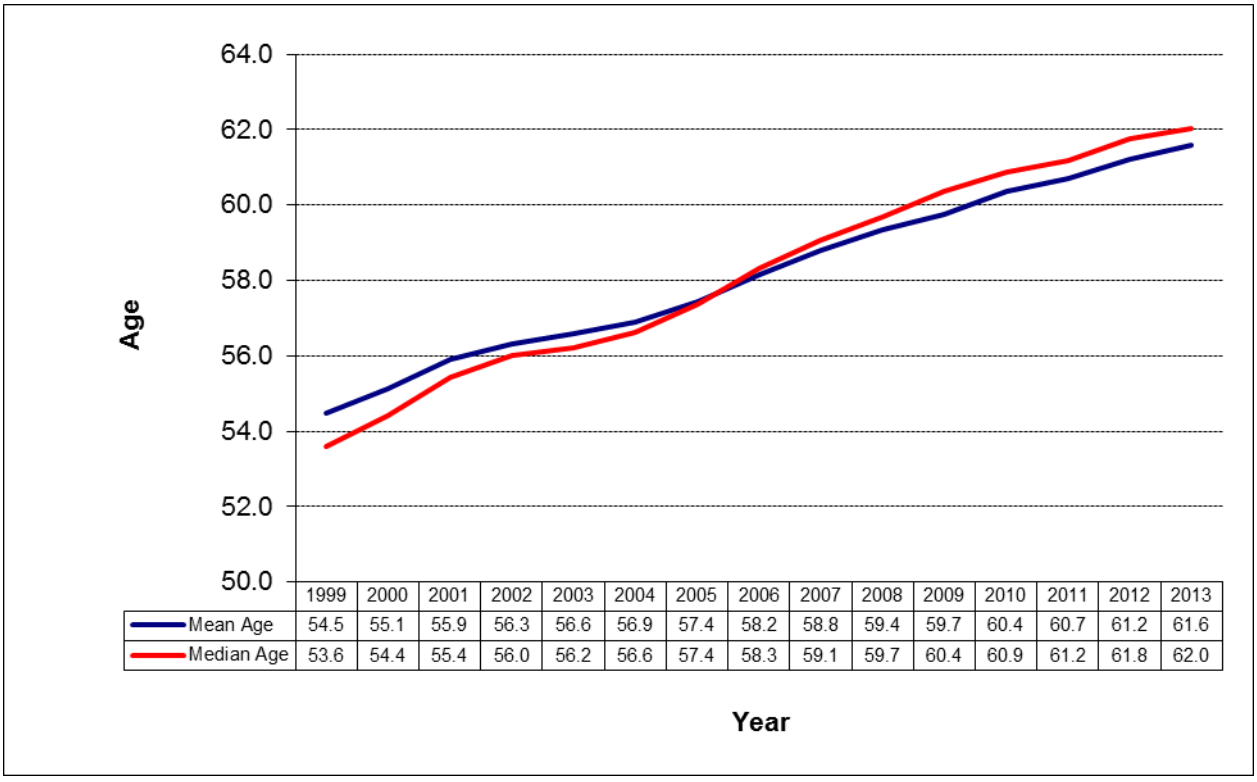
In 2013, the proportion of patients on HD aged 60 years and above was 56.7% compared with 57.6% for those on PD. See Table 8.3.2.2. The mean age of the patient on HD was 61.7 years (median 61.9 years) while for PD, this was 60.8 years (median 63.5 years). See Table 8.3.2.3.

Table 8.3.2.3: AGE OF PREVALENT PATIENTS BY MODALITY

MODALITY	2012			2013		
	Mean Age	Median Age	Std Dev	Mean Age	Median Age	Std Dev
HD	61.4	61.6	12.0	61.7	61.9	12.1
PD	60.2	63.1	15.5	60.8	63.5	15.6
HD+PD	**61.2**	**61.8**	**12.5**	**61.6**	**62.0**	**12.5**

The mean age of all prevalent patients on dialysis increased from 54.5 years old in 1999 to 61.6 years old in 2013. See Figure 8.3.2.2.

Figure 8.3.2.2: AGE OF PREVALENT DIALYSIS PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mean Age	54.5	55.1	55.9	56.3	56.6	56.9	57.4	58.2	58.8	59.4	59.7	60.4	60.7	61.2	61.6
Median Age	53.6	54.4	55.4	56.0	56.2	56.6	57.4	58.3	59.1	59.7	60.4	60.9	61.2	61.8	62.0

In 2012, 49.1% of the PD patients had DN as the aetiology for renal failure compared to 48.2% in HD patients. This was similar for 2013 where 50.5% of the PD patients had DN as the aetiology for renal failure compared to 49.6% in HD patients. Primary GN was the second most common aetiology for both HD and PD patients in 2012 and 2013. See Table 8.3.2.4.

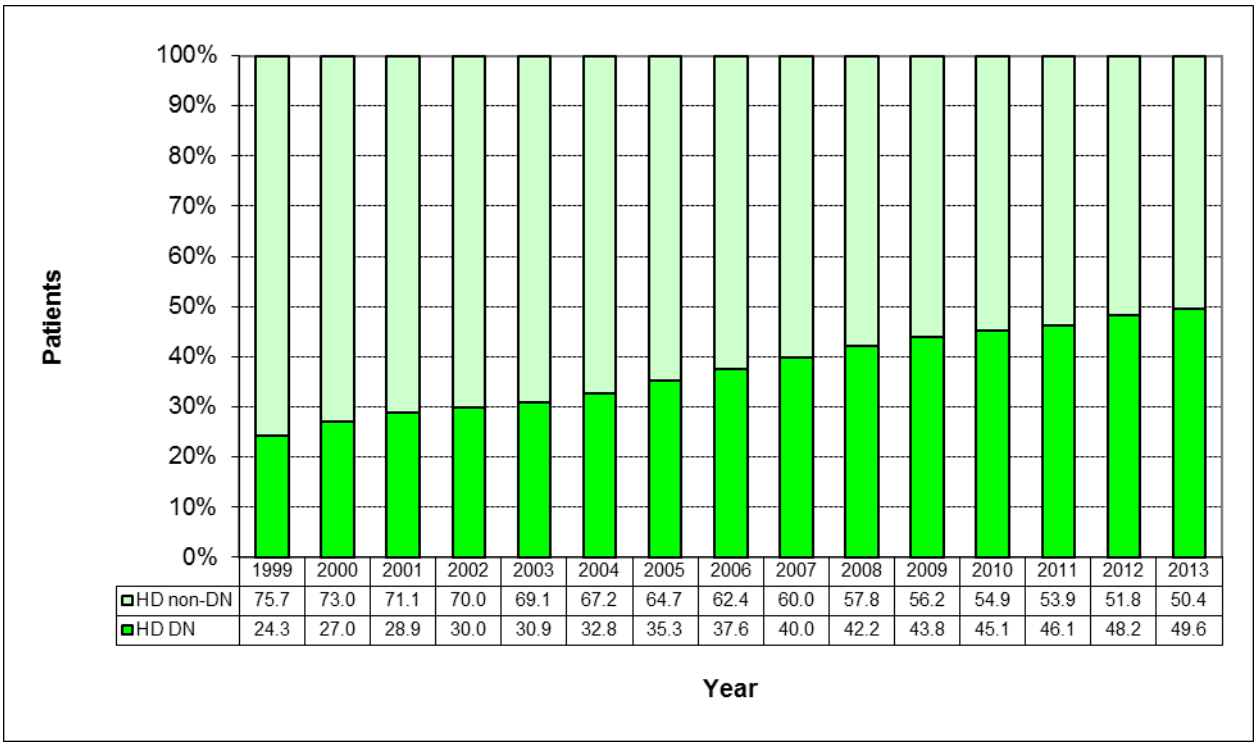
Table 8.3.2.4: PREVALENT DIALYSIS PATIENTS BY AETIOLOGY OF RENAL FAILURE AND MODALITY

Causes of CKD5	2012				2013			
	HD		PD		HD		PD	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	2223	48.2	310	49.1	2400	49.6	344	50.5
Primary Glomerulonephritis (GN)	1397	30.3	158	25.0	1403	29.0	171	25.1
Autoimmune Disease/GN with Systemic Manifestations	87	1.9	29	4.6	86	1.8	28	4.1
Hypertension and Renovascular Disease	510	11.1	88	13.9	547	11.3	90	13.2
Polycystic Kidney Disease / Other Cystic Diseases	153	3.3	9	1.4	166	3.4	17	2.5
Vesicoureteric Reflex / Chronic Pyelonephritis	22	0.5	4	0.6	21	0.4	4	0.6
Obstruction	45	1.0	4	0.6	53	1.1	2	0.3
Stone Disease	12	0.3	2	0.3	11	0.2	1	0.1
Miscellaneous	99	2.1	18	2.9	93	1.9	17	2.5
Unknown	65	1.4	9	1.4	60	1.2	7	1.0
All Causes	**4613**	**100**	**631**	**100**	**4840**	**100**	**681**	**100**

DN, as a cause of CKD5, has been rising among prevalent HD patients while the proportion appeared 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 – 2013

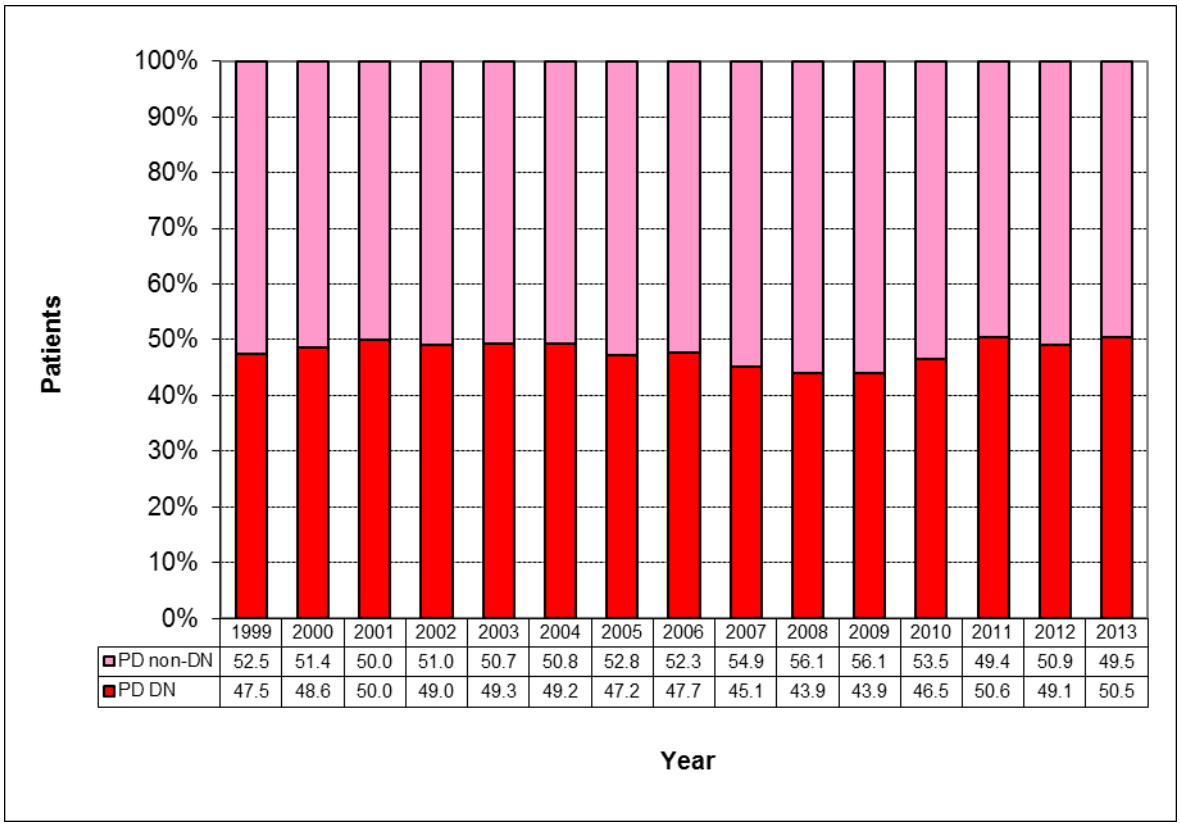
(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-DN	75.7	73.0	71.1	70.0	69.1	67.2	64.7	62.4	60.0	57.8	56.2	54.9	53.9	51.8	50.4
HD DN	24.3	27.0	28.9	30.0	30.9	32.8	35.3	37.6	40.0	42.2	43.8	45.1	46.1	48.2	49.6

Figure 8.3.2.3: PREVALENT DIALYSIS PATIENTS BY MODALITY AND AETIOLOGY, 1999 – 2013

(b) Peritoneal Dialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-DN	52.5	51.4	50.0	51.0	50.7	50.8	52.8	52.3	54.9	56.1	56.1	53.5	49.4	50.9	49.5
PD DN	47.5	48.6	50.0	49.0	49.3	49.2	47.2	47.7	45.1	43.9	43.9	46.5	50.6	49.1	50.5

8.4 Service Provider

8.4.1 Incident Patients

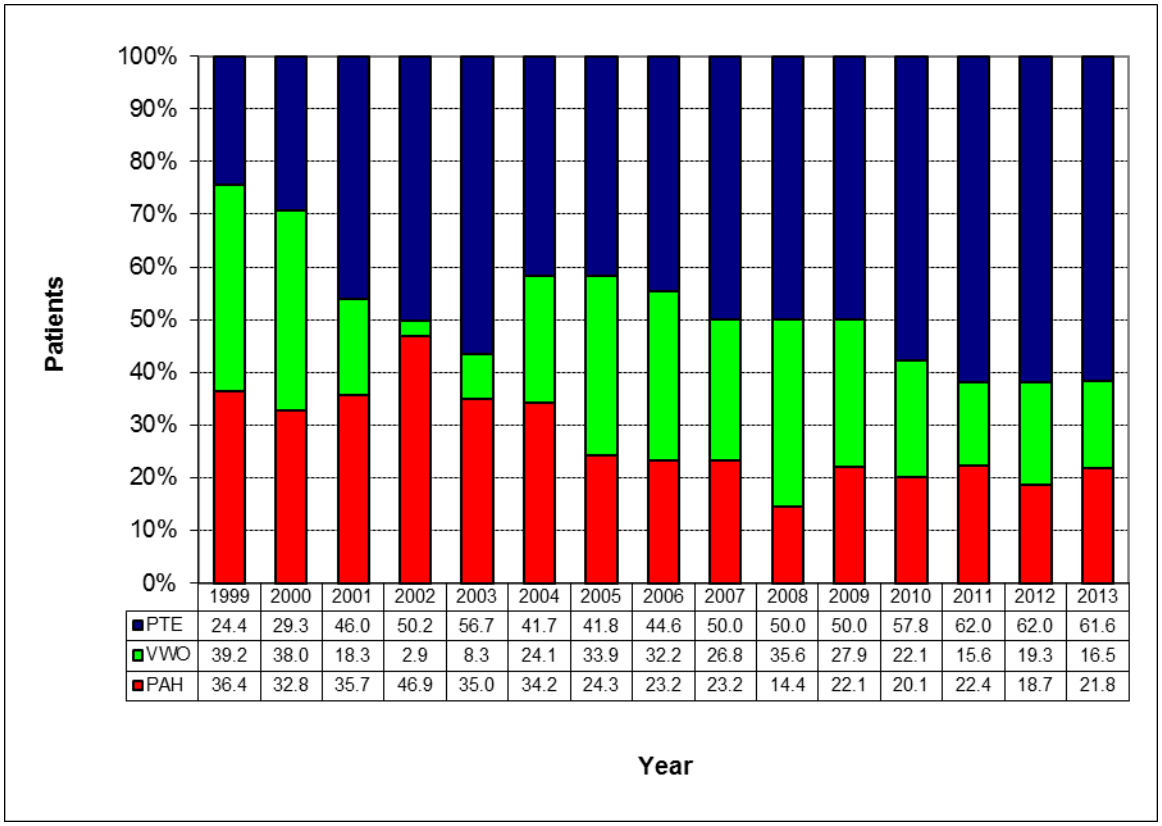
A substantial proportion of new dialysis patients went to the private centres (62.0% in 2012, 61.6% in 2013). Smaller proportion was dialysed in programmes at the PAHs, previously known as Restructured Hospitals (18.7% in 2012, 21.8% in 2013). The remainder went to centres run by VWOs (Table 8.4.1.1).

Table 8.4.1.1: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER	2012		2013	
	No	%	No	%
Public Acute Hospitals	172	18.7	213	21.8
Voluntary Welfare Organisations	178	19.3	161	16.5
Private Centres	571	62.0	601	61.6
All Providers	**921**	**100**	**975**	**100**

Except for the years 2002 and 2003, between 15% to 40% of incident patients were dialysed at centres managed by VWOs. Recent years showed fewer incident patients being dialysed at the VWOs. See Figure 8.4.1.1.

Figure 8.4.1.1: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	24.4	29.3	46.0	50.2	56.7	41.7	41.8	44.6	50.0	50.0	50.0	57.8	62.0	62.0	61.6
VWO	39.2	38.0	18.3	2.9	8.3	24.1	33.9	32.2	26.8	35.6	27.9	22.1	15.6	19.3	16.5
PAH	36.4	32.8	35.7	46.9	35.0	34.2	24.3	23.2	23.2	14.4	22.1	20.1	22.4	18.7	21.8

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 PAHs (60.5% in 2012, 54.4% in 2013).

Table 8.4.1.2: INCIDENT DIALYSIS PATIENTS BY AGE GROUP AND SERVICE PROVIDER

2012 AGE GROUP	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
0–19	8	4.7	1	0.6	0	0.0	9	1.0
20–29	4	2.3	2	1.1	13	2.3	19	2.1
30–39	5	2.9	5	2.8	19	3.3	29	3.1
40–49	14	8.1	26	14.6	69	12.1	109	11.8
50–59	37	21.5	68	38.2	122	21.4	227	24.6
60–69	49	28.5	53	29.8	178	31.2	280	30.4
70–79	45	26.2	18	10.1	128	22.4	191	20.7
80 +	10	5.8	5	2.8	42	7.4	57	6.2
All Age Groups	**172**	**100**	**178**	**100**	**571**	**100**	**921**	**100**

2013 AGE GROUP	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
0–19	5	2.3	0	0.0	0	0.0	5	0.5
20–29	8	3.8	1	0.6	11	1.8	20	2.1
30–39	9	4.2	6	3.7	23	3.8	38	3.9
40–49	16	7.5	28	17.4	75	12.5	119	12.2
50–59	59	27.7	59	36.6	160	26.6	278	28.5
60–69	52	24.4	49	30.4	172	28.6	273	28.0
70–79	42	19.7	14	8.7	113	18.8	169	17.3
80 +	22	10.3	4	2.5	47	7.8	73	7.5
All Age Groups	**213**	**100**	**161**	**100**	**601**	**100**	**975**	**100**

The mean age of the patients dialysing with the VWO centres was 60.7 years in 2012 and 60.9 years in 2013. Patients in PAHs 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	2012			2013		
	Mean Age	Median Age	Std Dev*	Mean Age	Median Age	Std Dev*
Public Acute Hospitals	60.7	63.8	16.5	60.9	62.2	16.2
Voluntary Welfare Organisations	58.5	58.7	11.2	58.1	58.2	10.7
Private Centres	62.2	63.5	13.2	61.5	61.7	12.9
All Providers	**61.2**	**62.6**	**13.6**	**60.8**	**61.1**	**13.4**

* Std Dev stands for Standard Deviation

PAHs did not provide much chronic outpatient HD facilities and cared for only a small proportion of new outpatient HD patients which was shown by the figures of 5.4% (42 out of 785) in 2012 and 5.5% (44 out of 802) in 2013. Thus, majority of HD patients (94.7% in 2012, 94.5% in 2013) were dialysed in VWOs and private centres. Majority of incident PD patients were cared for by the PAHs; 95.6% (130 out of 136) in 2012 and 97.7% (169 out of 173) in 2013. See Table 8.4.1.4.

Table 8.4.1.4: INCIDENT DIALYSIS PATIENTS BY SERVICE PROVIDER AND MODALITY

2012 SERVICE PROVIDER	HD		PD		HD+PD	
	No	%	No	%	No	%
Public Acute Hospitals	42	5.4	130	95.6	172	18.7
Voluntary Welfare Organisations	174	22.2	4	2.9	178	19.3
Private Centres	569	72.5	2	1.5	571	62.0
All Providers	**785**	**100**	**136**	**100**	**921**	**100**

2013 SERVICE PROVIDER	HD		PD		HD+PD	
	No	%	No	%	No	%
Public Acute Hospitals	44	5.5	169	97.7	213	21.8
Voluntary Welfare Organisations	159	19.8	2	1.2	161	16.5
Private Centres	599	74.7	2	1.2	601	61.6
All Providers	**802**	**100**	**173**	**100**	**975**	**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

MODALITY		2012				2013			
		PAH	VWO	PTE	All	PAH	VWO	PTE	All
HD	Mean	62.0	58.6	62.2	61.4	57.0	57.9	61.4	60.5
	Median	63.1	58.7	63.5	62.3	57.2	58.1	61.6	60.6
	Std. Deviation	17.8	10.9	13.2	13.1	18.2	10.6	12.9	12.9
PD	Mean	60.3	53.2	76.5	60.4	62.0	73.5	79.7	62.3
	Median	64.3	59.2	76.5	64.6	64.7	73.5	79.7	65.2
	Std. Deviation	16.2	21.0	16.6	16.3	15.6	14.5	9.0	15.6
HD+PD	Mean	60.7	58.5	62.2	61.2	60.9	58.1	61.5	60.8
	Median	63.8	58.7	63.5	62.6	62.2	58.2	61.7	61.1
	Std. Deviation	16.5	11.2	13.2	13.6	16.2	10.7	12.9	13.4

8.4.2 Prevalent Patients

Most of the prevalent dialysis patients were dialysed in centres runs by VWOs (55.1% in 2012, 53.9% in 2013). The PAHs dialysed 13.2% of all prevalent dialysis patients in 2012 and 13.1% in 2013. The remainder went to PTE. See Table 8.4.2.1.

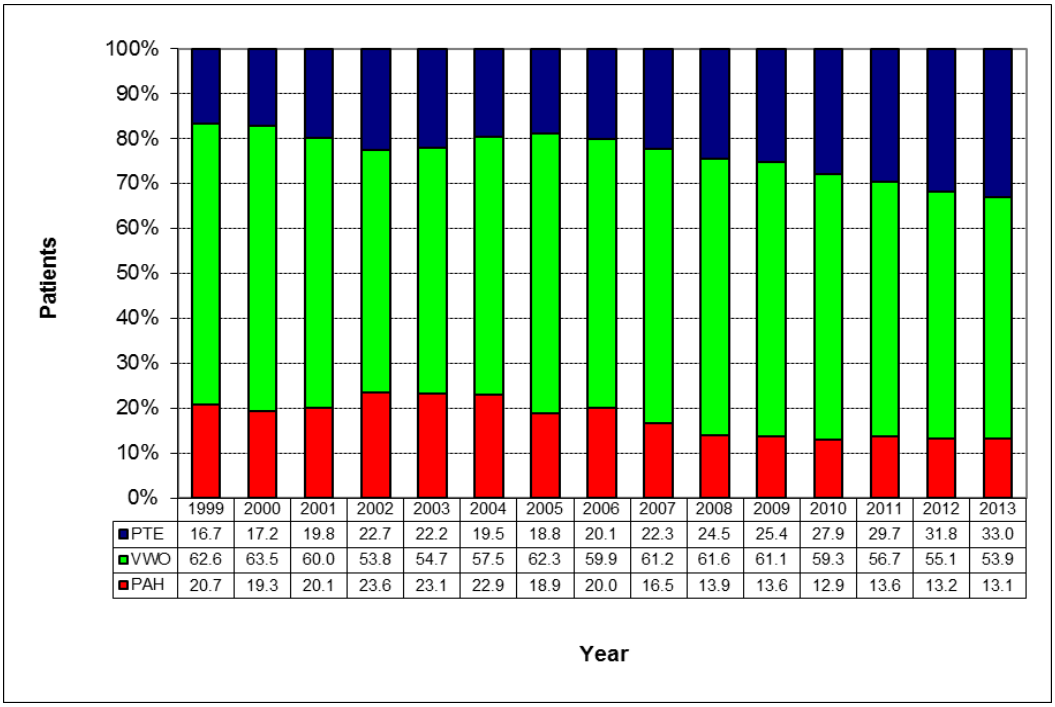
This pattern was different from that of the incident patients and was probably related to the practice of dialysing temporarily in a private centre while awaiting assessment and permanent placement for dialysis in a VWO.

Table 8.4.2.1: PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER	2012		2013	
	No	%	No	%
Public Acute Hospitals	690	13.2	724	13.1
Voluntary Welfare Organisations	2887	55.1	2976	53.9
Private Centres	1667	31.8	1821	33.0
All Providers	**5244**	**100**	**5521**	**100**

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

Figure 8.4.2.1: PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	16.7	17.2	19.8	22.7	22.2	19.5	18.8	20.1	22.3	24.5	25.4	27.9	29.7	31.8	33.0
VWO	62.6	63.5	60.0	53.8	54.7	57.5	62.3	59.9	61.2	61.6	61.1	59.3	56.7	55.1	53.9
PAH	20.7	19.3	20.1	23.6	23.1	22.9	18.9	20.0	16.5	13.9	13.6	12.9	13.6	13.2	13.1

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 (63.2% in 2012, 63.3% in 2013) and lowest in VWO centres (50.6% in 2012, 52.5% in 2013).

Table 8.4.2.2: DIALYSIS PATIENTS BY AGE GROUP AND SERVICE PROVIDER

2012 AGE GROUP	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
0–19	15	2.2	0	0.0	0	0.0	15	0.3
20–29	27	3.9	29	1.0	12	0.7	68	1.3
30–39	26	3.8	101	3.5	55	3.3	182	3.5
40–49	67	9.7	377	13.1	177	10.6	621	11.8
50–59	151	21.9	920	31.9	368	22.1	1439	27.4
60–69	214	31.0	915	31.7	504	30.2	1633	31.1
70–79	147	21.3	452	15.7	392	23.5	991	18.9
80 +	43	6.2	93	3.2	159	9.5	295	5.6
All Age Groups	**690**	**100**	**2887**	**100**	**1667**	**100**	**5244**	**100**

2013 AGE GROUP	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
0–19	11	1.5	0	0.0	0	0.0	11	0.2
20–29	32	4.4	30	1.0	11	0.6	73	1.3
30–39	32	4.4	101	3.4	66	3.6	199	3.6
40–49	60	8.3	362	12.2	189	10.4	611	11.1
50–59	168	23.2	923	31.0	402	22.1	1493	27.0
60–69	214	29.6	970	32.6	555	30.5	1739	31.5
70–79	151	20.9	484	16.3	410	22.5	1045	18.9
80 +	56	7.7	106	3.6	188	10.3	350	6.3
All Age Groups	**724**	**100**	**2976**	**100**	**1821**	**100**	**5521**	**100**

The mean age of the prevalent patients dialysing with the VWO centres was 60.0 years in 2012 and 60.4 in 2013. Patients in private sector were the oldest (mean age 63.6 in 2012, 63.8 in 2013). See Table 8.4.2.3.

Table 8.4.2.3: AGE OF PREVALENT DIALYSIS PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER	2012			2013		
	Mean Age	Median Age	Std Dev*	Mean Age	Median Age	Std Dev*
Public Acute Hospitals	60.5	63.3	15.5	61.1	63.9	15.6
Voluntary Welfare Organisations	60.0	60.1	11.3	60.4	60.7	11.3
Private Centres	63.6	64.3	12.7	63.8	64.0	12.8
All Providers	**61.2**	**61.8**	**12.5**	**61.6**	**62.0**	**12.5**

* Std Dev stands for Standard Deviation

As in the new patients, the majority of the patients in the PAHs did PD (84.3% in 2012, 88.1% in 2013). 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

2012 SERVICE PROVIDER	HD		PD		HD+PD	
	No	%	No	%	No	%
Public Acute Hospitals	108	15.7	582	84.3	690	13.2
Voluntary Welfare Organisations	2845	98.5	42	1.5	2887	55.1
Private Centres	1660	99.6	7	0.4	1667	31.8
All Providers	**4613**	**88.0**	**631**	**12.0**	**5244**	**100**

2013 SERVICE PROVIDER	HD		PD		HD+PD	
	No	%	No	%	No	%
Public Acute Hospitals	86	11.9	638	88.1	724	13.1
Voluntary Welfare Organisations	2940	98.8	36	1.2	2976	53.9
Private Centres	1814	99.6	7	0.4	1821	33.0
All Providers	**4840**	**87.7**	**681**	**12.3**	**5521**	**100**

Private sector dialysis patients tend to be relatively older in years 2012 and 2013. See Table 8.4.2.5.

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

MODALITY		2012				2013			
		PAH	VWO	PTE	All	PAH	VWO	PTE	All
HD	Mean	60.9	60.0	63.6	61.4	62.3	60.4	63.8	61.7
	Median	62.0	60.2	64.3	61.6	62.9	60.7	63.9	61.9
	Std. Deviation	14.3	11.3	12.7	12.0	14.9	11.3	12.8	12.1
PD	Mean	60.4	56.5	63.9	60.2	60.9	57.0	68.6	60.8
	Median	63.6	56.0	65.1	63.1	64.1	57.0	68.9	63.5
	Std. Deviation	15.7	11.4	16.0	15.5	15.7	13.3	14.4	15.6
HD+PD	Mean	60.5	60.0	63.6	61.2	61.1	60.4	63.8	61.6
	Median	63.3	60.1	64.3	61.8	63.9	60.7	64.0	62.0
	Std. Deviation	15.5	11.3	12.7	12.5	15.6	11.3	12.8	12.5

8.5 Co-morbid Conditions

DM is reported as a co-morbid condition, even if the cause of renal failure was not due to DN.

8.5.1 Incident Patients

DM as a co-morbid condition occurred in 72.1% of patients newly started on dialysis in 2012 and 71.1% in 2013. See Table 8.5.1.1.

IHD was reported in 48.0% of patients in 2012 and 44.3% in 2013. This was 21.5% in 2012 and 24.2% in 2013 for CVD. PVD was reported in 15.9% of patients in 2012 and 12.6% in 2013.

There were 11.3% of patients who were current smokers in 2012. Another 22.6% were former smokers. The status was unknown in 2.5% of patients. In 2013, 10.3% were current smokers while 22.7% were former smokers.

In 2012, 3.3% of the patients were serologically positive for HBsAg, while in 2013 the percentage decreased to 2.6%. Fewer patients were positive for anti-Hepatitis C Virus (HCV) antibody (0.7% in 2012, 0.8% in 2013). Many PD patients did not have HBsAg and anti-HCV antibody test results within the last 6 months (18.5% for PD versus 0.6% for HD in 2013).

Table 8.5.1.1: INCIDENT DIALYSIS PATIENTS BY CO-MORBID CONDITIONS

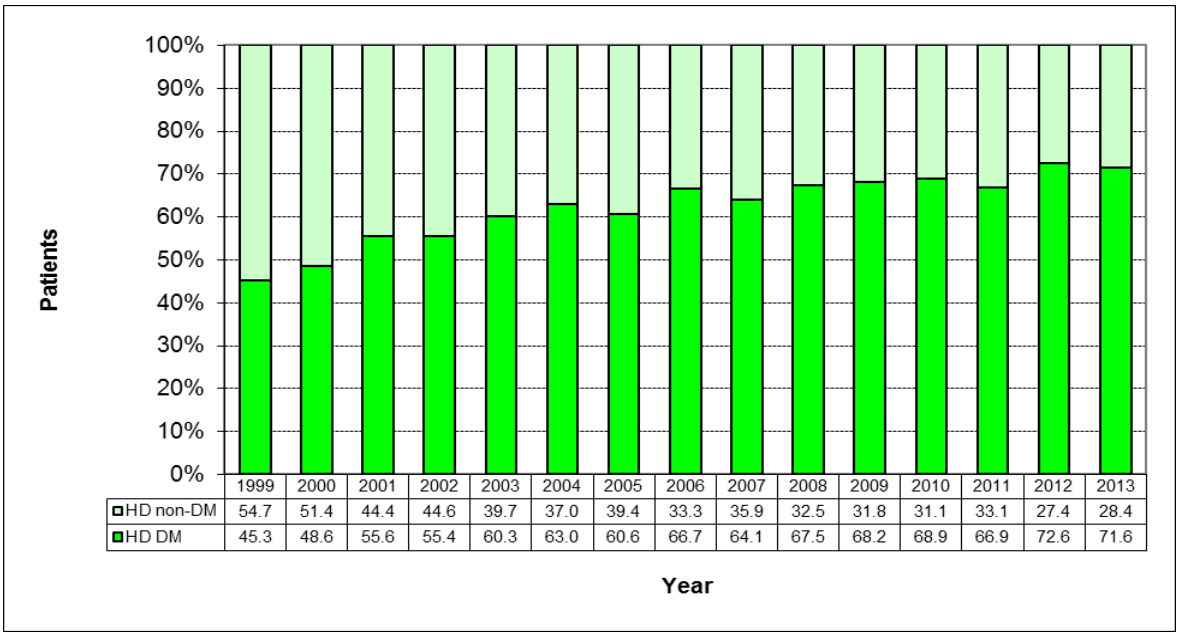
Diabetes Mellitus	2012						2013					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	570	72.6	94	69.1	664	72.1	574	71.6	119	68.8	693	71.1
No	215	27.4	42	30.9	257	27.9	228	28.4	54	31.2	282	28.9
Unknown	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
Ischaemic Heart Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	382	48.7	60	44.1	442	48.0	359	44.8	73	42.2	432	44.3
No	402	51.2	76	55.9	478	51.9	443	55.2	100	57.8	543	55.7
Unknown	1	0.1	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
Cerebrovascular Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	167	21.3	31	22.8	198	21.5	194	24.2	42	24.3	236	24.2
No	616	78.5	105	77.2	721	78.3	608	75.8	131	75.7	739	75.8
Unknown	2	0.3	0	0.0	2	0.2	0	0.0	0	0.0	0	0.0
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
Peripheral Vascular Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	125	15.9	21	15.4	146	15.9	101	12.6	22	12.7	123	12.6
No	659	83.9	115	84.6	774	84.0	701	87.4	151	87.3	852	87.4
Unknown	1	0.1	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
Smoking	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Current Smoker	94	12.0	10	7.4	104	11.3	85	10.6	15	8.7	100	10.3
Ex-Smoker	180	22.9	28	20.6	208	22.6	192	23.9	29	16.8	221	22.7
Non-Smoker	491	62.5	95	69.9	586	63.6	513	64.0	126	72.8	639	65.5
Unknown	20	2.5	3	2.2	23	2.5	12	1.5	3	1.7	15	1.5
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
HBsAg Status	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Positive	25	3.2	5	3.7	30	3.3	23	2.9	2	1.2	25	2.6
Negative	748	95.3	115	84.6	863	93.7	772	96.3	139	80.3	911	93.4
Unknown	12	1.5	16	11.8	28	3.0	7	0.9	32	18.5	39	4.0
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**
Anti-HCV Status	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Positive	6	0.8	0	0.0	6	0.7	6	0.7	2	1.2	8	0.8
Negative	768	97.8	119	87.5	887	96.3	791	98.6	139	80.3	930	95.4
Unknown	11	1.4	17	12.5	28	3.0	5	0.6	32	18.5	37	3.8
Total	**785**	**100**	**136**	**100**	**921**	**100**	**802**	**100**	**173**	**100**	**975**	**100**

DM and IHD were more common in patients on HD than those on PD in 2012 and 2013, whereas the converse was true for CVD. For PVD, this was more common in patients on HD than those on PD in 2012, however in 2013, the gap had converged. See Table 8.5.1.1.

The proportion of incident patients on HD with DM as a co-morbidity had increased over the years (from 45.3% in 1999 to 71.6% in 2013) while that for PD, it had fluctuated from 71.0% to 68.8% for the period 1999 to 2013. See Figure 8.5.1.1.

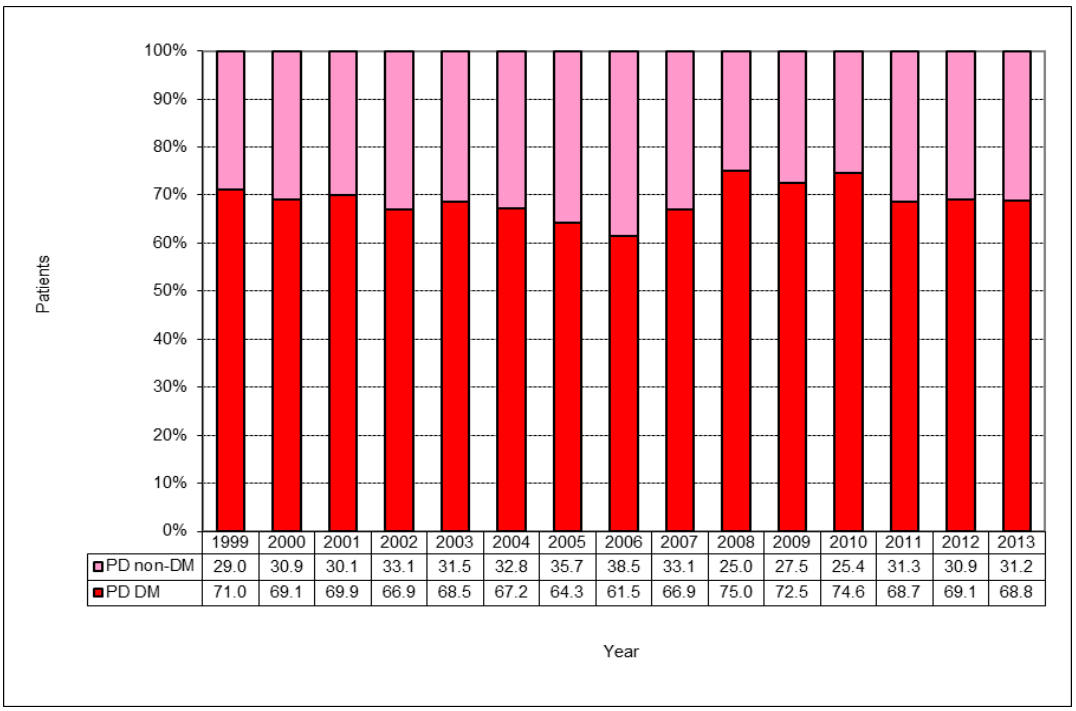
Figure 8.5.1.1: INCIDENT DIALYSIS PATIENTS BY MODALITY AND DIABETES MELLITUS, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-DM	54.7	51.4	44.4	44.6	39.7	37.0	39.4	33.3	35.9	32.5	31.8	31.1	33.1	27.4	28.4
HD DM	45.3	48.6	55.6	55.4	60.3	63.0	60.6	66.7	64.1	67.5	68.2	68.9	66.9	72.6	71.6

(b) Peritoneal Dialysis

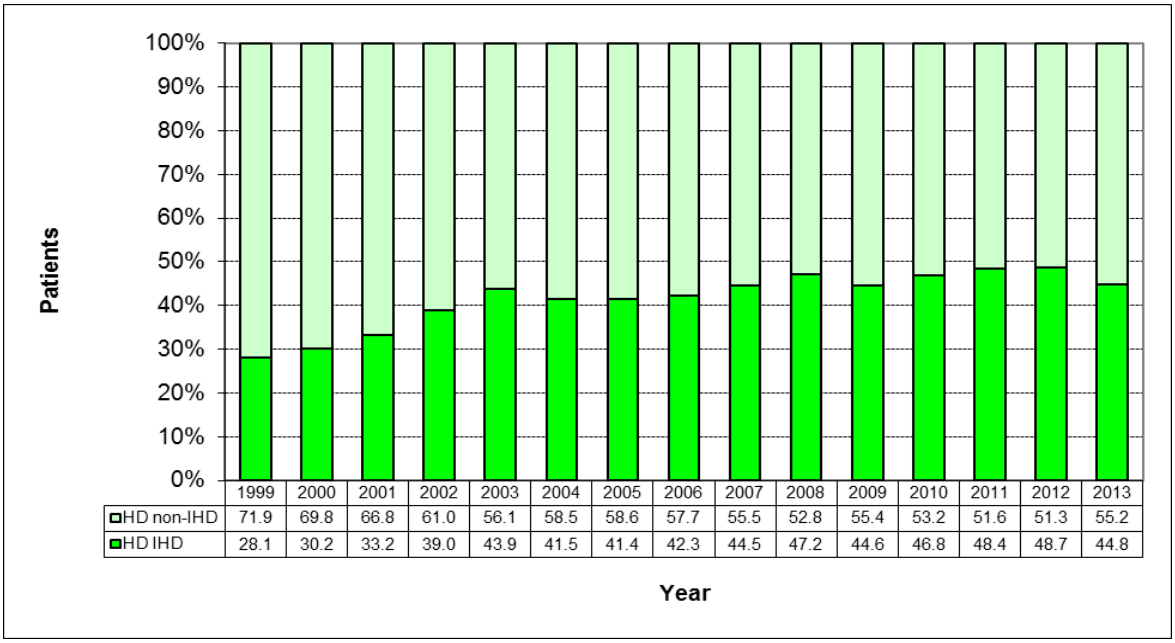


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-DM	29.0	30.9	30.1	33.1	31.5	32.8	35.7	38.5	33.1	25.0	27.5	25.4	31.3	30.9	31.2
PD DM	71.0	69.1	69.9	66.9	68.5	67.2	64.3	61.5	66.9	75.0	72.5	74.6	68.7	69.1	68.8

The proportion of incident dialysis patients on HD with IHD as a co-morbidity had risen through the years (28.1% in 1999 to 44.8% in 2013). There was a decrease in the proportion of PD patients with IHD as co-morbidity from 63.1% in 1999 to 46.0% in 2002, thereafter the proportion hovered around at an average of 50%. See Figure 8.5.1.2.

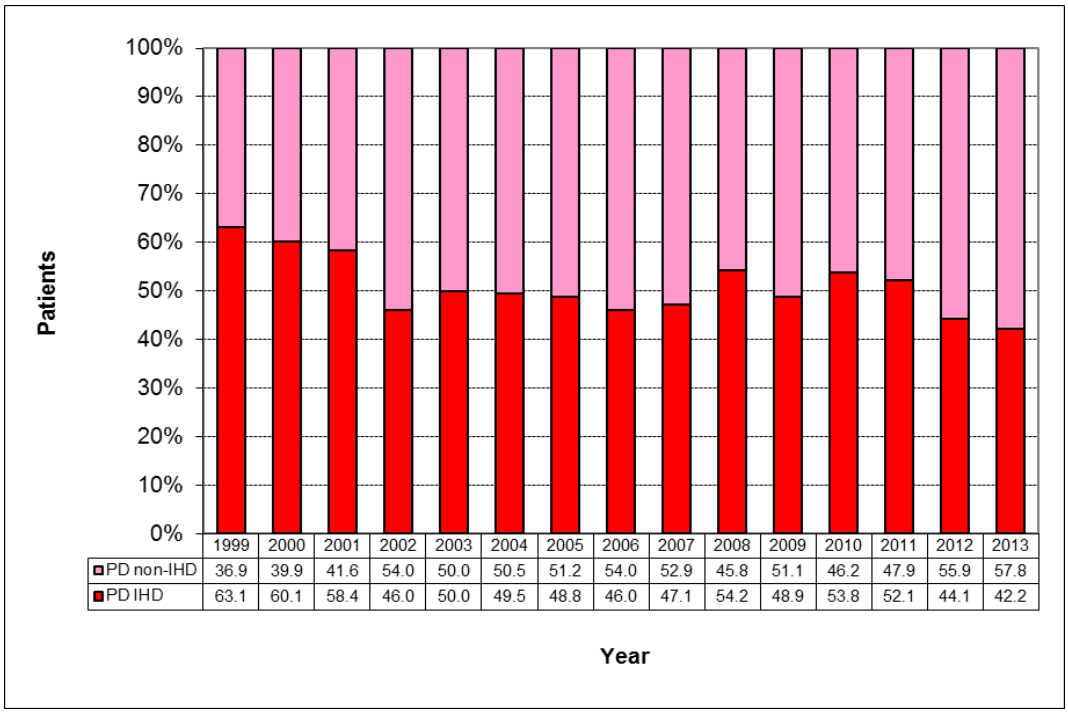
Figure 8.5.1.2: INCIDENT DIALYSIS PATIENTS BY MODALITY AND ISCHAEMIC HEART DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-IHD	71.9	69.8	66.8	61.0	56.1	58.5	58.6	57.7	55.5	52.8	55.4	53.2	51.6	51.3	55.2
HD IHD	28.1	30.2	33.2	39.0	43.9	41.5	41.4	42.3	44.5	47.2	44.6	46.8	48.4	48.7	44.8

(b) Peritoneal Dialysis

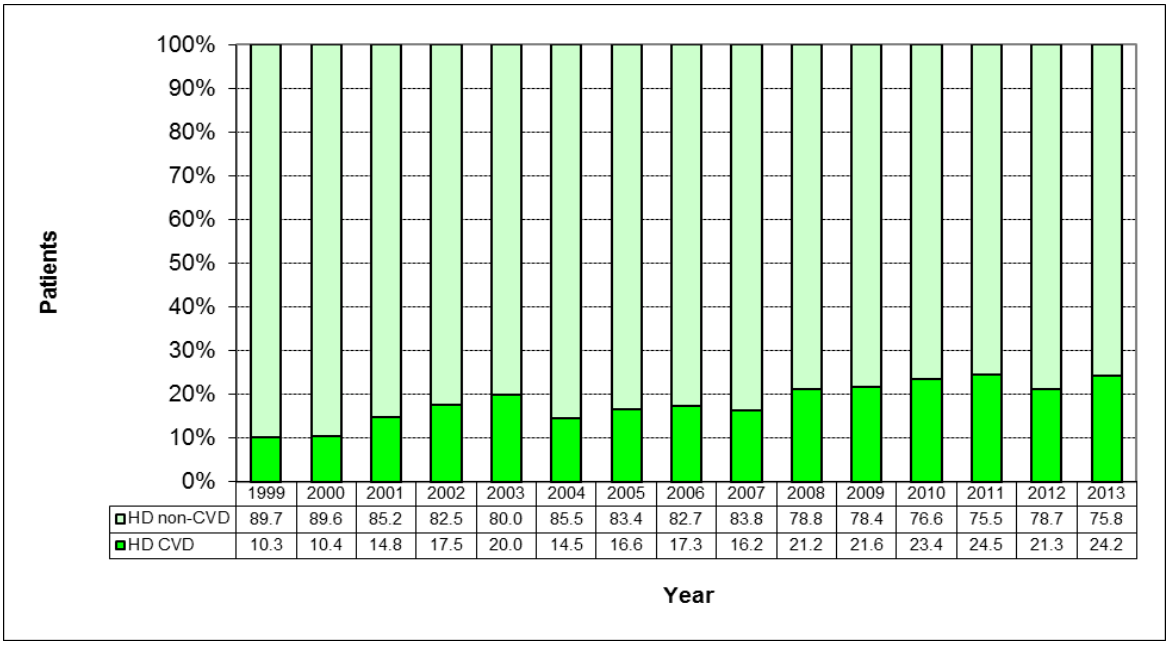


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-IHD	36.9	39.9	41.6	54.0	50.0	50.5	51.2	54.0	52.9	45.8	51.1	46.2	47.9	55.9	57.8
PD IHD	63.1	60.1	58.4	46.0	50.0	49.5	48.8	46.0	47.1	54.2	48.9	53.8	52.1	44.1	42.2

The proportion of incident dialysis patients on HD with CVD as a co-morbidity fluctuated between 10.3% to 24.5% for the period 1999 to 2013; while this was between 19.1% to 31.5% for those on PD. See Figure 8.5.1.3.

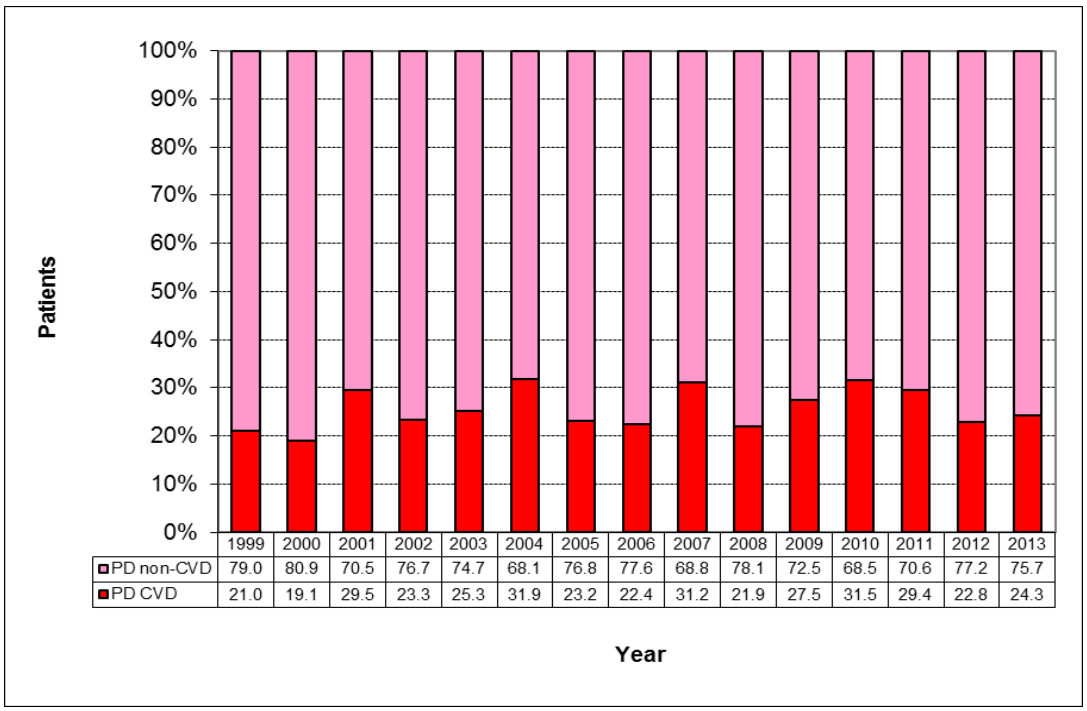
Figure 8.5.1.3: INCIDENT DIALYSIS PATIENTS BY MODALITY AND CEREBROVASCULAR DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-CVD	89.7	89.6	85.2	82.5	80.0	85.5	83.4	82.7	83.8	78.8	78.4	76.6	75.5	78.7	75.8
HD CVD	10.3	10.4	14.8	17.5	20.0	14.5	16.6	17.3	16.2	21.2	21.6	23.4	24.5	21.3	24.2

(b) Peritoneal Dialysis

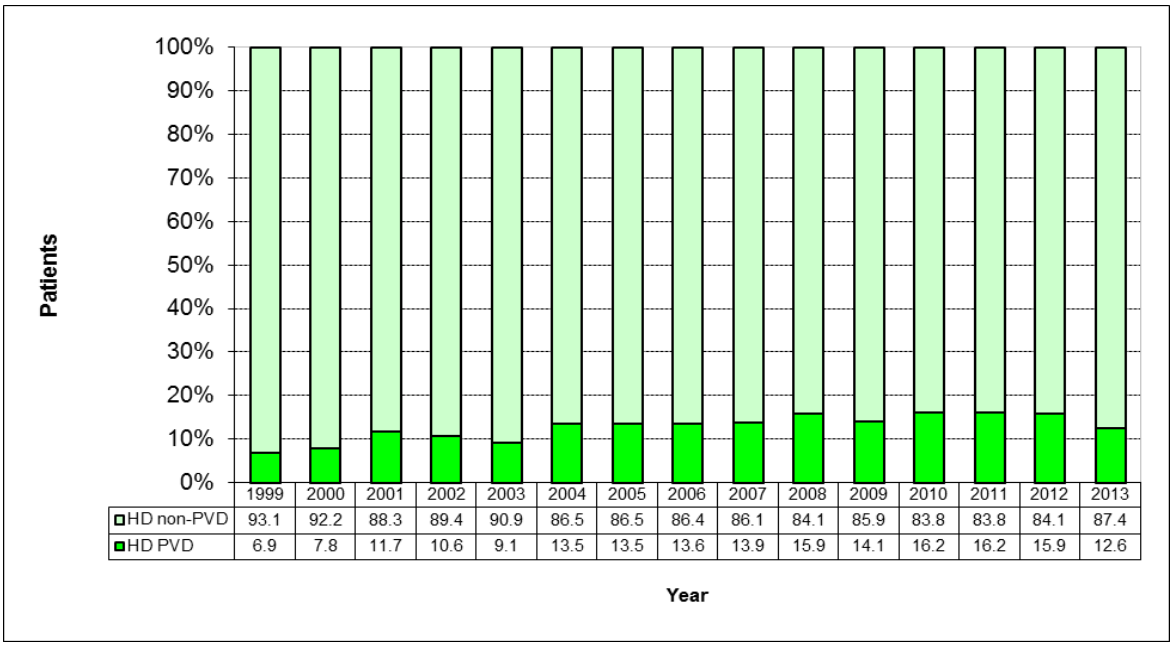


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-CVD	79.0	80.9	70.5	76.7	74.7	68.1	76.8	77.6	68.8	78.1	72.5	68.5	70.6	77.2	75.7
PD CVD	21.0	19.1	29.5	23.3	25.3	31.9	23.2	22.4	31.2	21.9	27.5	31.5	29.4	22.8	24.3

PVD as a co-morbidity increased from 6.9% in 1999 to 12.6% in 2013 for incident HD patients while that for PD, it fluctuated between 8.1% to 19.8% for the same time period. See Figure 8.5.1.4.

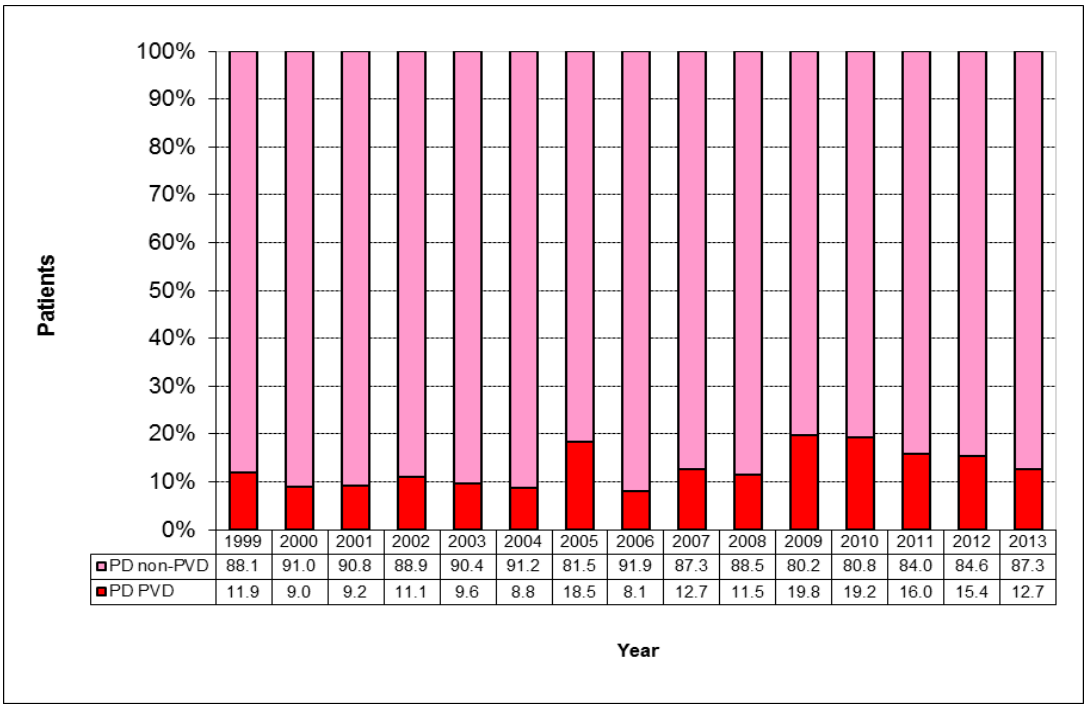
Figure 8.5.1.4: INCIDENT DIALYSIS PATIENTS BY MODALITY AND PERIPHERAL VASCULAR DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-PVD	93.1	92.2	88.3	89.4	90.9	86.5	86.5	86.4	86.1	84.1	85.9	83.8	83.8	84.1	87.4
HD PVD	6.9	7.8	11.7	10.6	9.1	13.5	13.5	13.6	13.9	15.9	14.1	16.2	16.2	15.9	12.6

(b) Peritoneal Dialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-PVD	88.1	91.0	90.8	88.9	90.4	91.2	81.5	91.9	87.3	88.5	80.2	80.8	84.0	84.6	87.3
PD PVD	11.9	9.0	9.2	11.1	9.6	8.8	18.5	8.1	12.7	11.5	19.8	19.2	16.0	15.4	12.7

8.5.2 Prevalent Patients

DM was present in 56.0% of prevalent patients in 2012 and 57.6% in 2013.

IHD was present in 46.8% in 2012 and 46.3% in 2013. For CVD, this was 20.2% in 2012 and 20.5% in 2013. See Table 8.5.2.1.

There were 9.7% of patients who were current smokers in 2012 and 9.9% in 2013. Former smokers were 23.5% in 2012 and 22.8% in 2013.

HBsAg positivity was found in 3.8% of patients in 2012 and 3.4% in 2013. Anti-HCV antibody positive status was present in 3.7% of patients in 2012 and 3.4% in 2013.

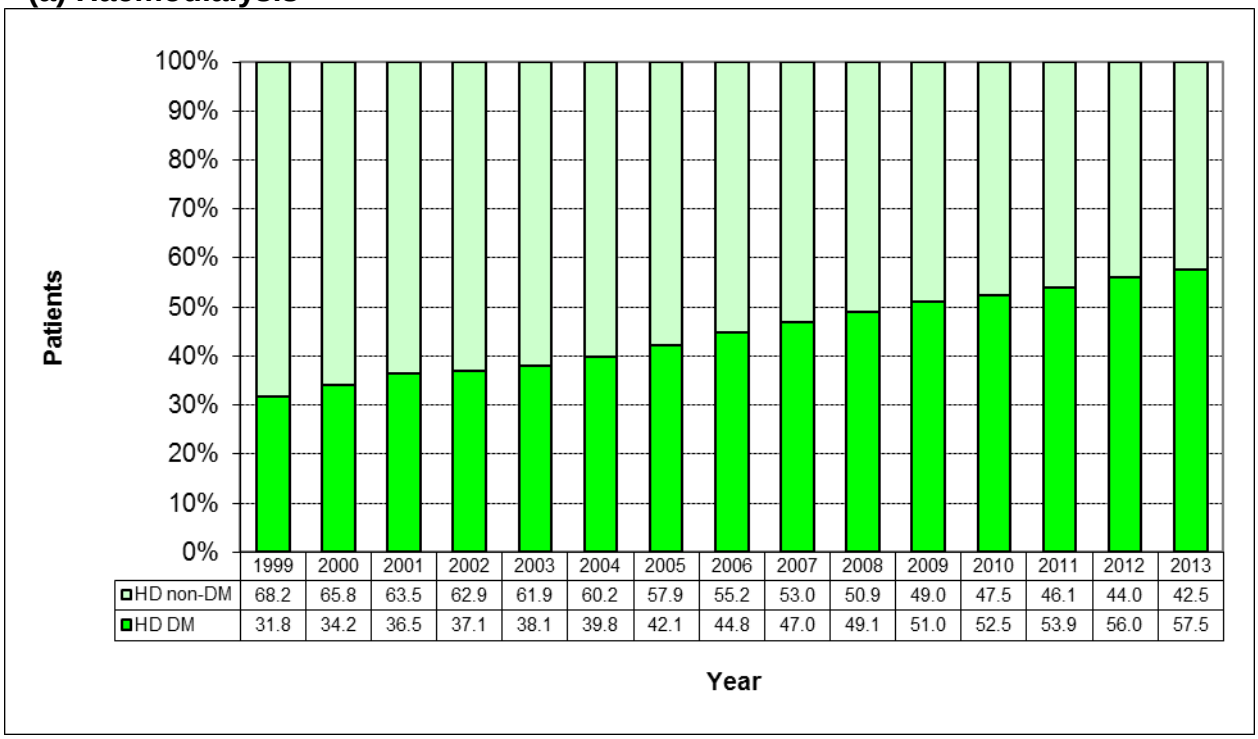
Table 8.5.2.1: PREVALENT DIALYSIS PATIENTS BY CO-MORBID CONDITIONS

Diabetes Mellitus	2012						2013					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	2581	56.0	357	56.6	2938	56.0	2784	57.5	394	57.9	3178	57.6
No	2032	44.0	274	43.4	2306	44.0	2056	42.5	287	42.1	2343	42.4
Unknown	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
Ischaemic Heart Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	2158	46.8	296	46.9	2454	46.8	2263	46.8	295	43.3	2558	46.3
No	2452	53.2	335	53.1	2787	53.1	2575	53.2	386	56.7	2961	53.6
Unknown	3	0.1	0	0.0	3	0.1	2	0.0	0	0.0	2	0.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
Cerebrovascular Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	916	19.9	142	22.5	1058	20.2	996	20.6	135	19.8	1131	20.5
No	3695	80.1	489	77.5	4184	79.8	3844	79.4	546	80.2	4390	79.5
Unknown	2	0.0	0	0.0	2	0.0	0	0.0	0	0.0	0	0.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
Peripheral Vascular Disease	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	731	15.8	83	13.2	814	15.5	751	15.5	81	11.9	832	15.1
No	3880	84.1	548	86.8	4428	84.4	4088	84.5	600	88.1	4688	84.9
Unknown	2	0.0	0	0.0	2	0.0	1	0.0	0	0.0	1	0.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
Smoking	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Current Smoker	473	10.3	36	5.7	509	9.7	499	10.3	45	6.6	544	9.9
Ex-Smoker	1102	23.9	132	20.9	1234	23.5	1131	23.4	130	19.1	1261	22.8
Non-Smoker	2992	64.9	457	72.4	3449	65.8	3164	65.4	499	73.3	3663	66.3
Unknown	46	1.0	6	1.0	52	1.0	46	1.0	7	1.0	53	1.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
HBsAg Status	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Positive	185	4.0	16	2.5	201	3.8	169	3.5	19	2.8	188	3.4
Negative	4422	95.9	582	92.2	5004	95.4	4670	96.5	611	89.7	5281	95.7
Unknown	6	0.1	33	5.2	39	0.7	1	0.0	51	7.5	52	0.9
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**
Anti-HCV Status	**2012**						**2013**					
	HD		PD		HD+PD		HD		PD		HD+PD	
	No	%	No	%	No	%	No	%	No	%	No	%
Positive	186	4.0	7	1.1	193	3.7	178	3.7	7	1.0	185	3.4
Negative	4420	95.8	588	93.2	5008	95.5	4660	96.3	621	91.2	5281	95.7
Unknown	7	0.2	36	5.7	43	0.8	2	0.0	53	7.8	55	1.0
Total	**4613**	**100**	**631**	**100**	**5244**	**100**	**4840**	**100**	**681**	**100**	**5521**	**100**

An increasing proportion of HD patients, 31.8% in 1999 compared to 57.5% in 2013, have DM whereas the proportion for PD patients has been stable. See Figure 8.5.2.1. Similar trends have been noted for IHD as a co-morbid condition. See Figure 8.5.2.2.

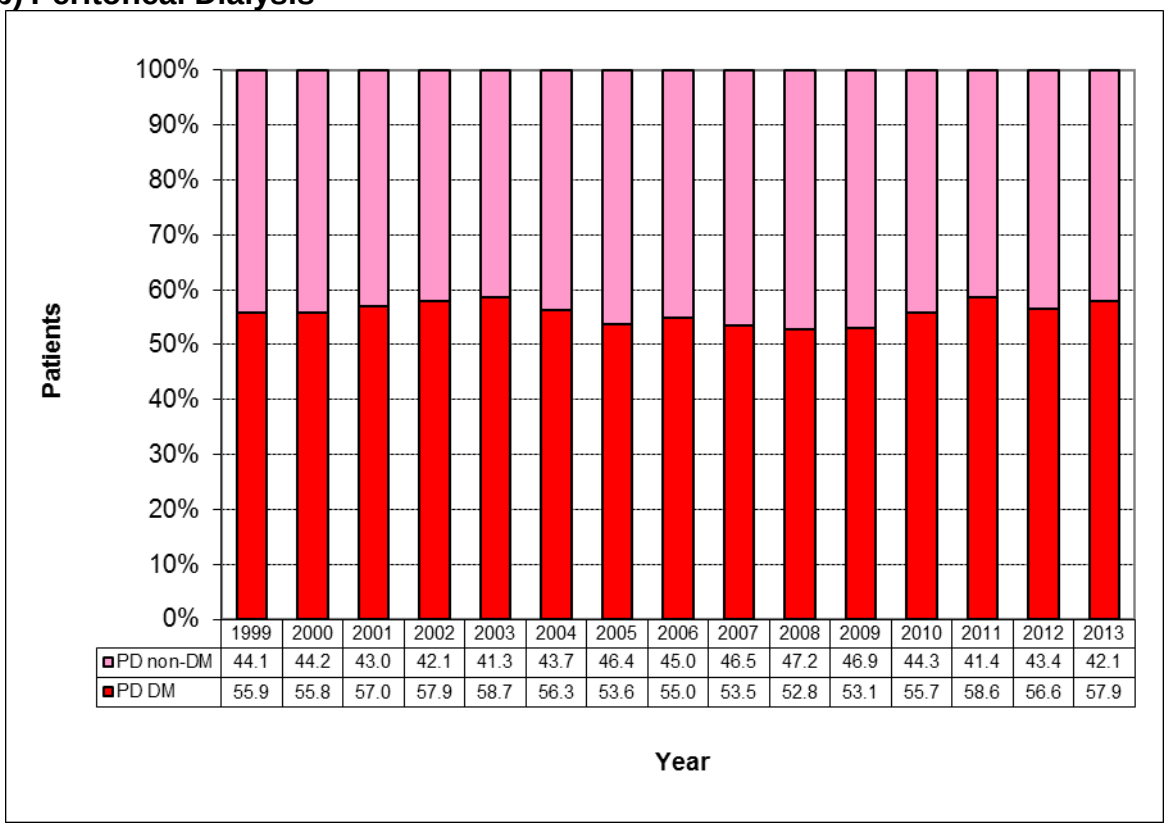
Figure 8.5.2.1: PREVALENT DIALYSIS PATIENTS BY MODALITY AND DIABETES MELLITUS, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-DM	68.2	65.8	63.5	62.9	61.9	60.2	57.9	55.2	53.0	50.9	49.0	47.5	46.1	44.0	42.5
HD DM	31.8	34.2	36.5	37.1	38.1	39.8	42.1	44.8	47.0	49.1	51.0	52.5	53.9	56.0	57.5

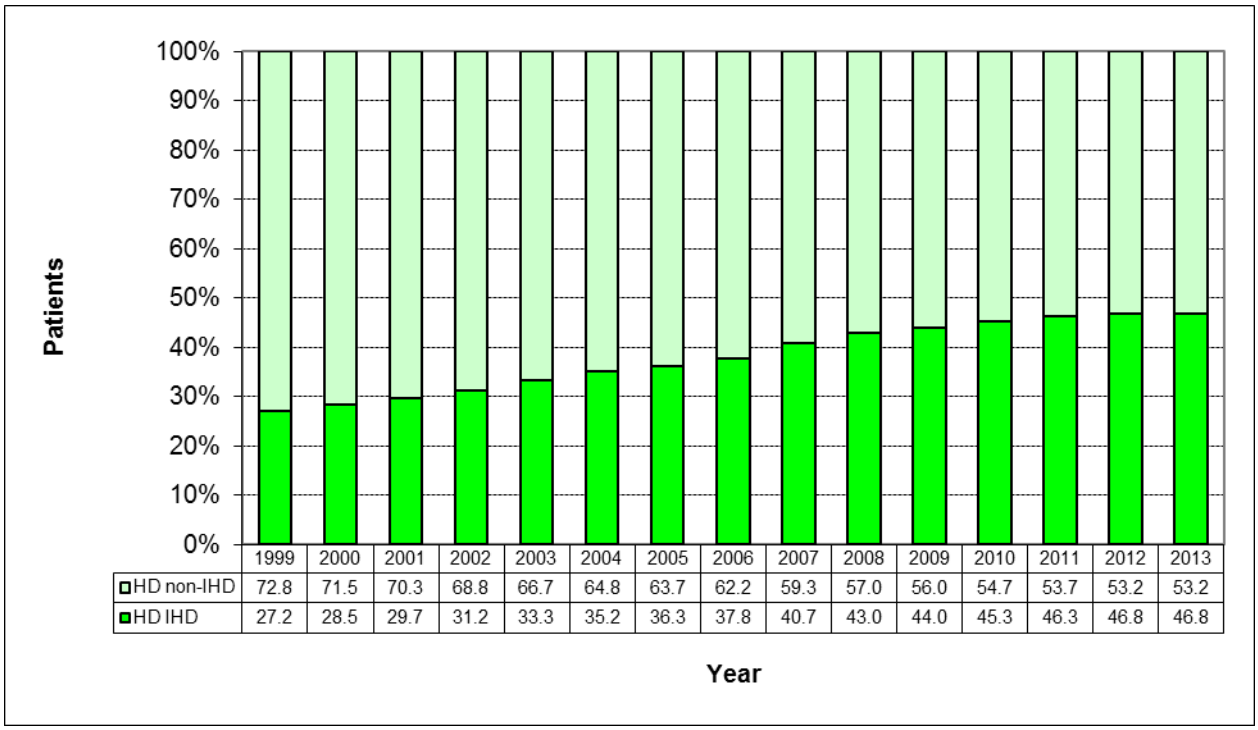
(b) Peritoneal Dialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-DM	44.1	44.2	43.0	42.1	41.3	43.7	46.4	45.0	46.5	47.2	46.9	44.3	41.4	43.4	42.1
PD DM	55.9	55.8	57.0	57.9	58.7	56.3	53.6	55.0	53.5	52.8	53.1	55.7	58.6	56.6	57.9

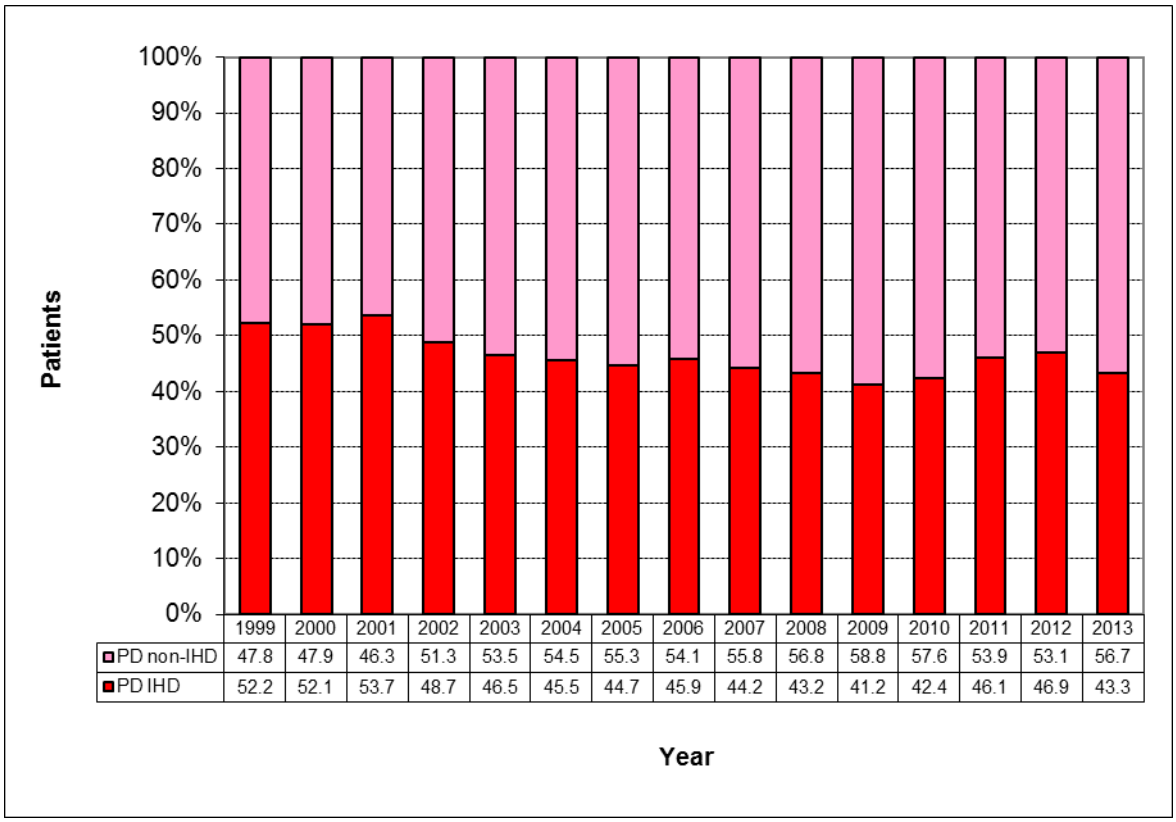
Figure 8.5.2.2: PREVALENT DIALYSIS PATIENTS BY MODALITY AND ISCHAEMIC HEART DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-IHD	72.8	71.5	70.3	68.8	66.7	64.8	63.7	62.2	59.3	57.0	56.0	54.7	53.7	53.2	53.2
HD IHD	27.2	28.5	29.7	31.2	33.3	35.2	36.3	37.8	40.7	43.0	44.0	45.3	46.3	46.8	46.8

(b) Peritoneal Dialysis

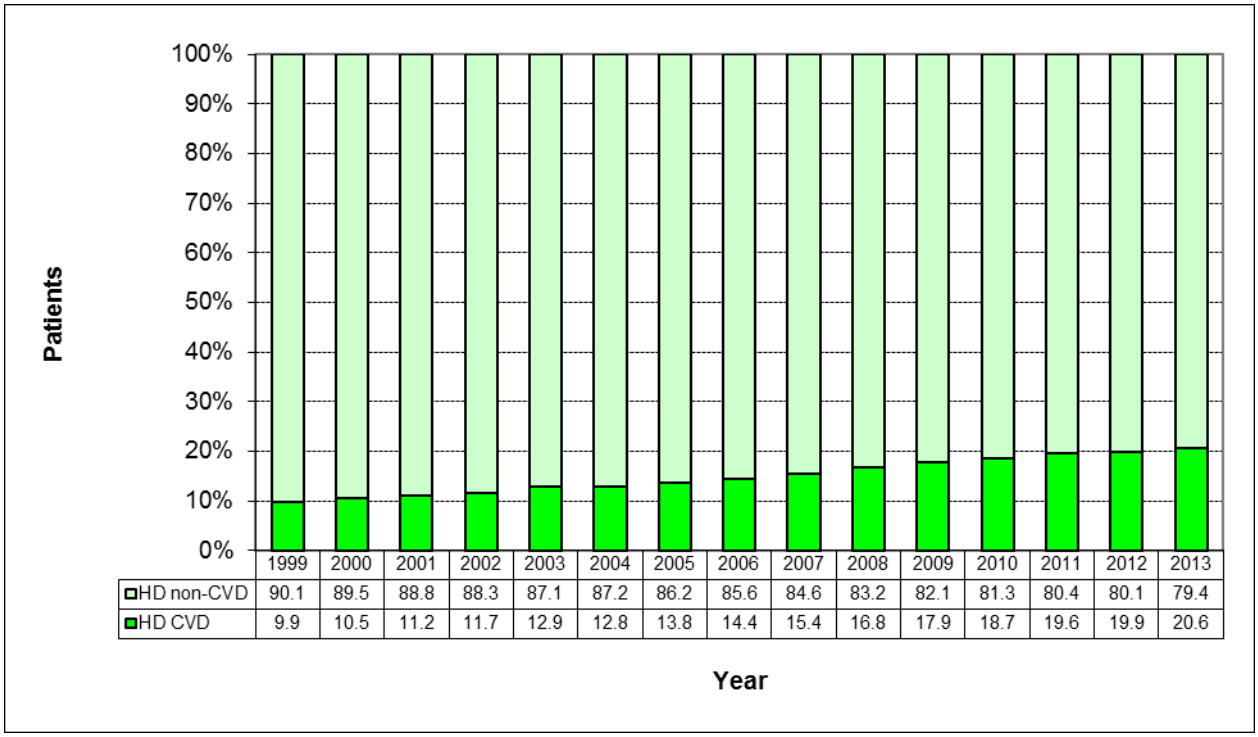


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-IHD	47.8	47.9	46.3	51.3	53.5	54.5	55.3	54.1	55.8	56.8	58.8	57.6	53.9	53.1	56.7
PD IHD	52.2	52.1	53.7	48.7	46.5	45.5	44.7	45.9	44.2	43.2	41.2	42.4	46.1	46.9	43.3

There was a similar rising trend in the prevalent HD patients for CVD as a co-morbid condition (9.9% in 1999 to 20.6% in 2013). The proportion of patients on PD increased from 15.3% in 1999 to 22.6% in 2004, before hovering at about 20% in the period 2005 – 2013. See Figure 8.5.2.3.

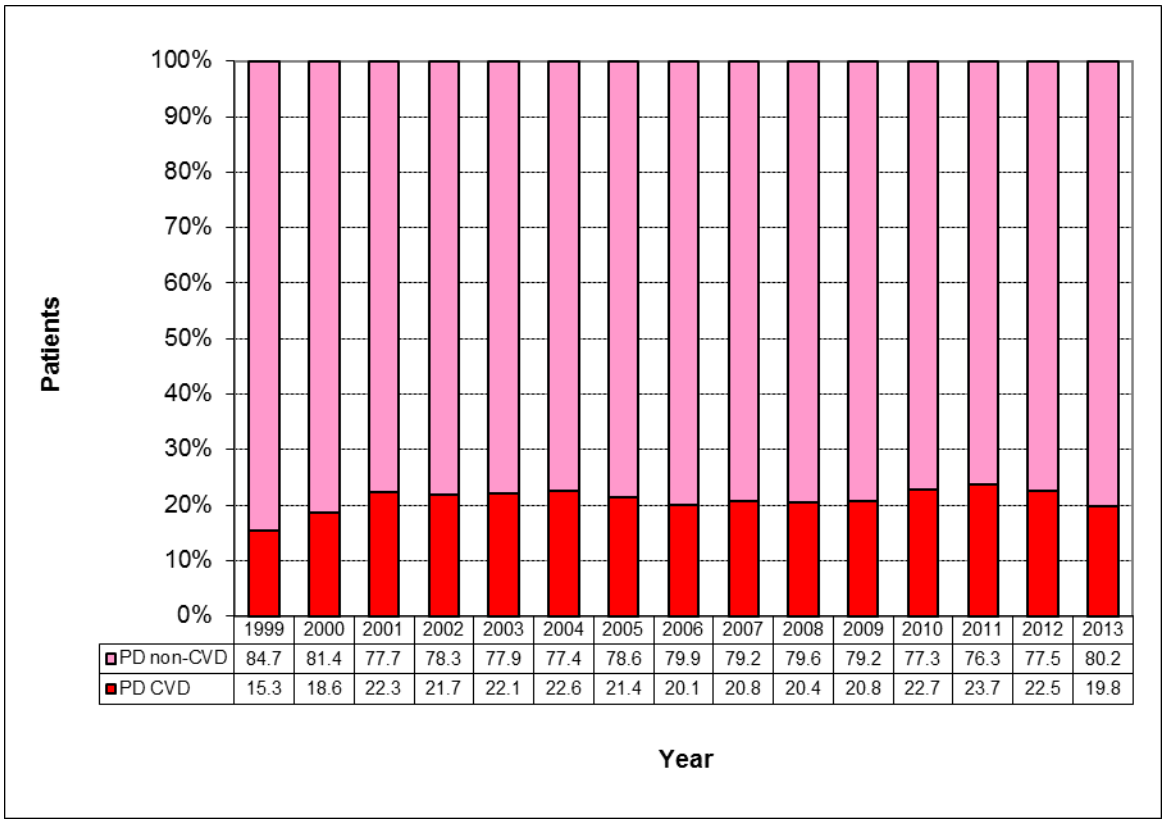
Figure 8.5.2.3: PREVALENT DIALYSIS PATIENTS BY MODALITY, CEREBROVASCULAR DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-CVD	90.1	89.5	88.8	88.3	87.1	87.2	86.2	85.6	84.6	83.2	82.1	81.3	80.4	80.1	79.4
HD CVD	9.9	10.5	11.2	11.7	12.9	12.8	13.8	14.4	15.4	16.8	17.9	18.7	19.6	19.9	20.6

(b) Peritoneal Dialysis

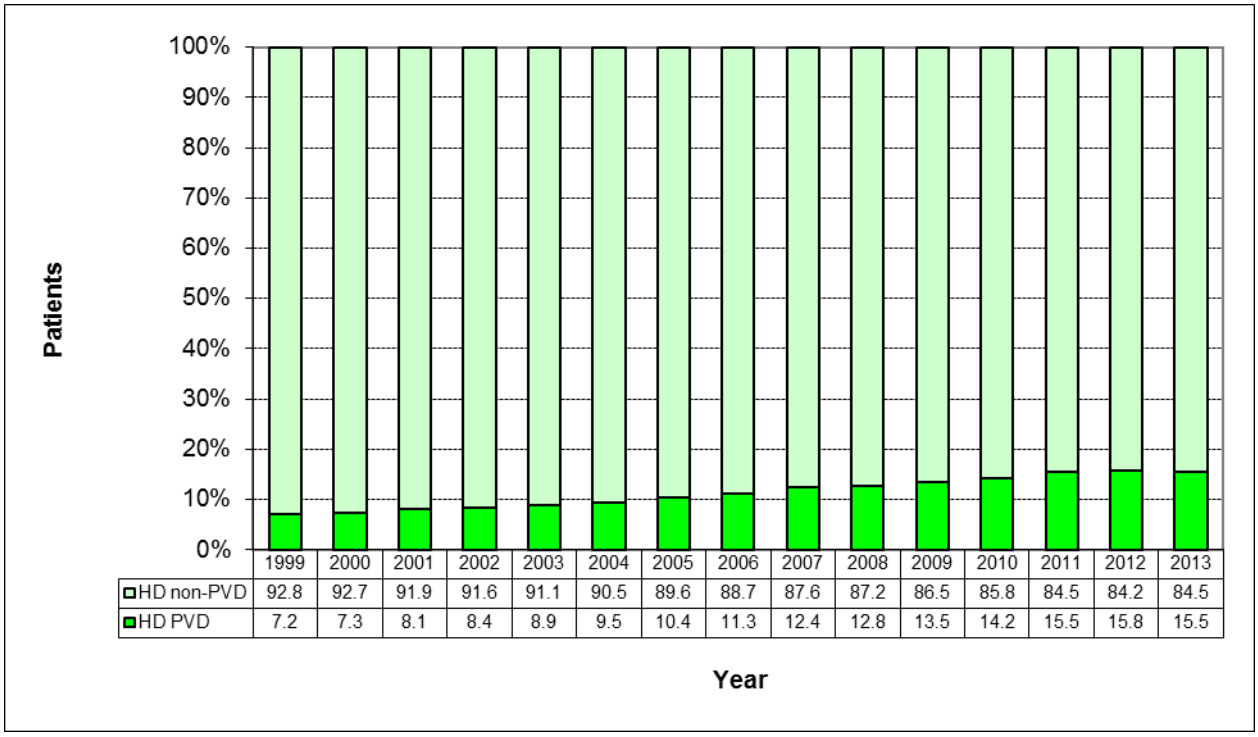


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-CVD	84.7	81.4	77.7	78.3	77.9	77.4	78.6	79.9	79.2	79.6	79.2	77.3	76.3	77.5	80.2
PD CVD	15.3	18.6	22.3	21.7	22.1	22.6	21.4	20.1	20.8	20.4	20.8	22.7	23.7	22.5	19.8

The proportion of prevalent patients on HD having PVD as a co-morbid condition increased gradually from 7.2% in 1999 to 15.5% in2013. For patients on PD, this fluctuated between 9.0% to 13.9% for the same time period. See Figure 8.5.2.4.

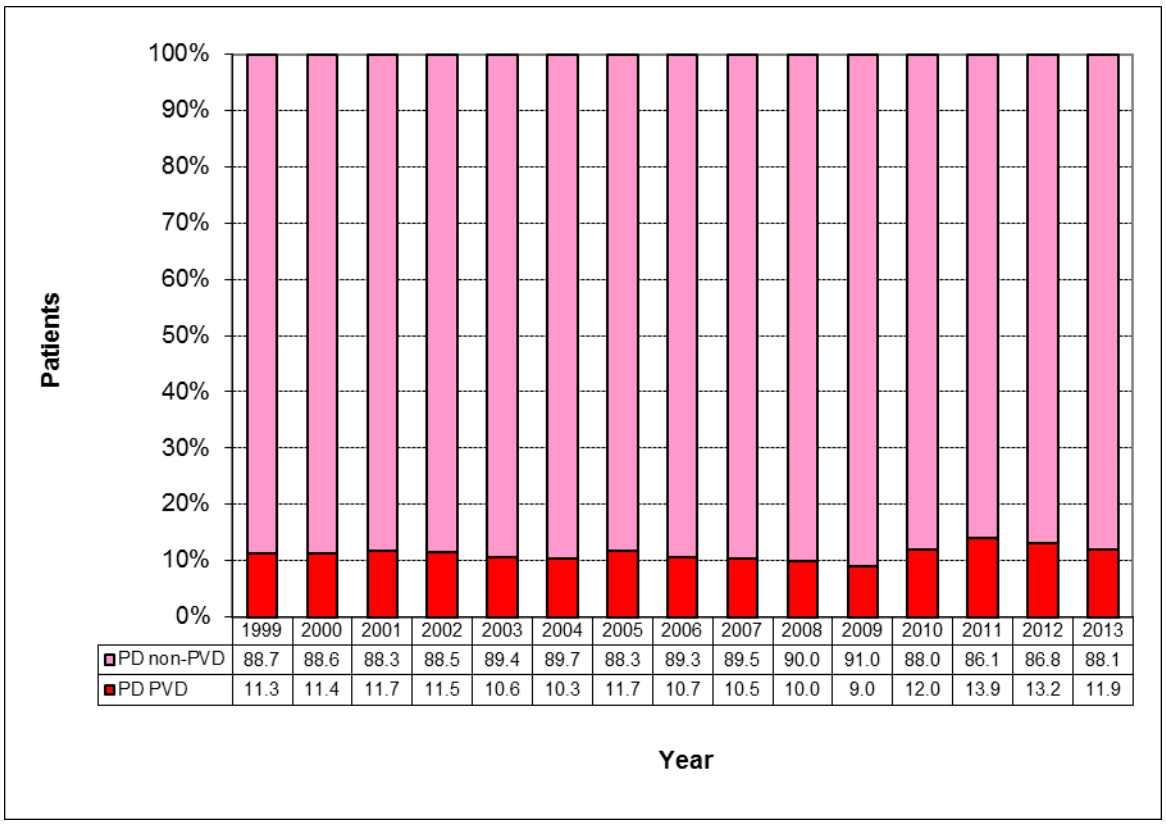
Figure 8.5.2.4: PREVALENT DIALYSIS PATIENTS BY MODALITY AND PERIPHERAL VASCULAR DISEASE, 1999 – 2013

(a) Haemodialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HD non-PVD	92.8	92.7	91.9	91.6	91.1	90.5	89.6	88.7	87.6	87.2	86.5	85.8	84.5	84.2	84.5
HD PVD	7.2	7.3	8.1	8.4	8.9	9.5	10.4	11.3	12.4	12.8	13.5	14.2	15.5	15.8	15.5

(b) Peritoneal Dialysis



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PD non-PVD	88.7	88.6	88.3	88.5	89.4	89.7	88.3	89.3	89.5	90.0	91.0	88.0	86.1	86.8	88.1
PD PVD	11.3	11.4	11.7	11.5	10.6	10.3	11.7	10.7	10.5	10.0	9.0	12.0	13.9	13.2	11.9

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 13.5% in 2012 and 8.6% in 2013. See Table 8.6.1.1.1.

Table 8.6.1.1.1: INCIDENT DIALYSIS PATIENTS BY EDUCATIONAL LEVEL

EDUCATIONAL LEVEL	2012		2013	
	No	%	No	%
No formal education	124	13.5	84	8.6
Low primary	246	26.7	284	29.1
PSLE Certificate	129	14.0	73	7.5
GCE N level passes	7	0.8	9	0.9
GCE O level passes	261	28.3	363	37.2
GCE A level passes	14	1.5	11	1.1
Diploma	27	2.9	39	4.0
University and above	36	3.9	43	4.4
Unknown/Others	77	8.4	69	7.1
All Educational Levels	**921**	**100**	**975**	**100**

8.6.1.2 Prevalent Patients

The prevalent dialysis patients who had no formal education were 15.1% in 2012 and 13.2% in 2013. See Table 8.6.1.2.1.

Table 8.6.1.2.1: PREVALENT DIALYSIS PATIENTS BY EDUCATIONAL LEVEL

EDUCATIONAL LEVEL	2012		2013	
	No	%	No	%
No formal education	791	15.1	730	13.2
Low primary	1264	24.1	1353	24.5
PSLE Certificate	1144	21.8	1080	19.6
GCE N level passes	102	1.9	98	1.8
GCE O level passes	1292	24.6	1512	27.4
GCE A level passes	123	2.3	123	2.2
Diploma	171	3.3	196	3.6
University and above	202	3.9	226	4.1
Unknown/Others	155	3.0	203	3.7
All Educational Levels	**5244**	**100**	**5521**	**100**

8.7 Haemodialysis

8.7.1 Incidence and Prevalence

During 2012, there were 785 new HD patients (CR 205.6 pmp; ASR 143.0 pmp) who started on HD and 41 were transplanted. During 2013, there were 802 new HD patients (CR 208.6 pmp; ASR 139.6 pmp) who started on HD and 64 were transplanted.

There were 530 deaths in 2012 and 654 in 2013 among HD patients.

The prevalent HD population numbered 4,613 patients (CR 1,208.3 pmp; ASR 828.8 pmp) in 2012 and 4,840 patients (CR 1,259.0 pmp; ASR 837.5 pmp) in 2013. See Table 8.7.1.1.

Table 8.7.1.1: INCIDENT AND PREVALENT HD PATIENTS

	2012				2013			
	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	785	41	530	4613	802	64	654	4840
CR*	205.6	10.7	138.8	1208.3	208.6	16.6	170.1	1259.0
ASR*	143.0	-	93.4	828.8	139.6	-	110.4	837.5

* per million resident population

8.7.2 Incidence

The mean age for incident HD patients increased from 52.6 years old in 1999 to 60.5 years old in 2013. See Figure 8.7.2.1.

Within the incident HD population, 57.3% in 2012 and 57.0% in 2013 were males. In 2012, 57.1% of patients were aged 60 years and above while in 2013 it was 51.4%. See Table 8.7.2.1.

Figure 8.7.2.1: MEAN AGE OF INCIDENT HD PATIENTS, 1999 – 2013

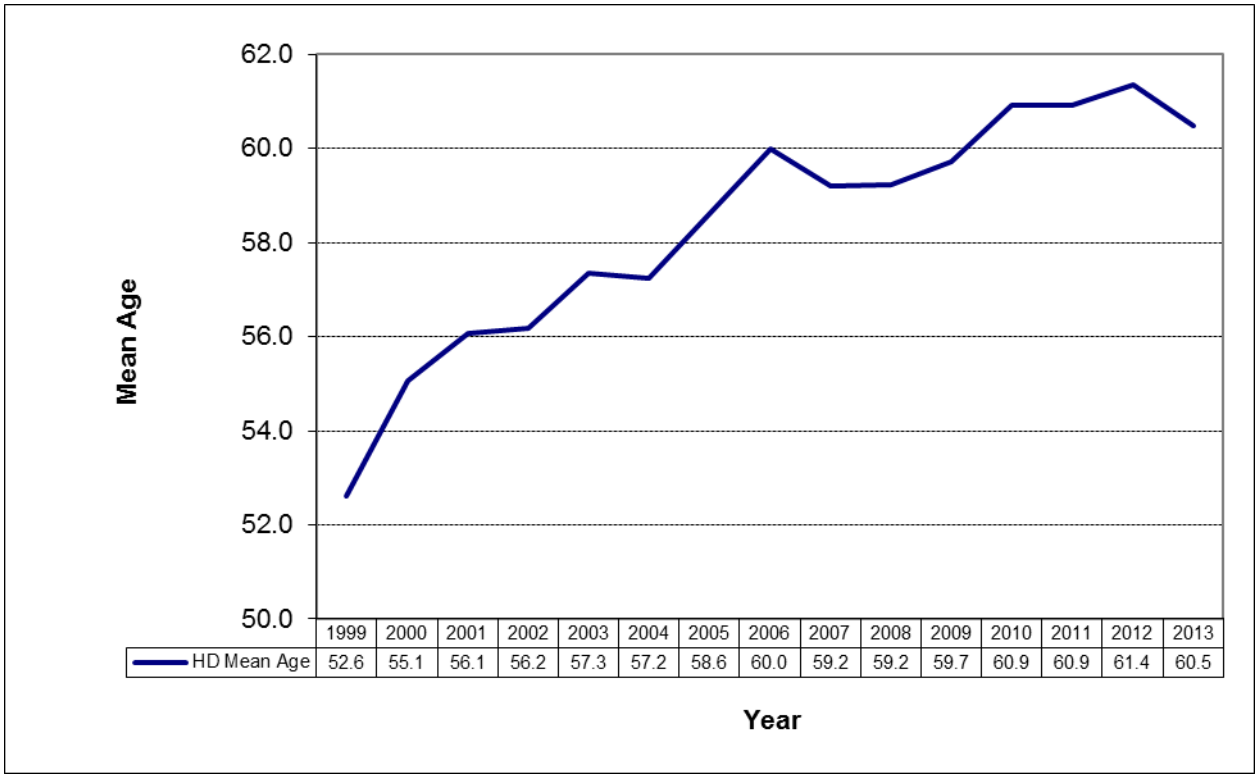


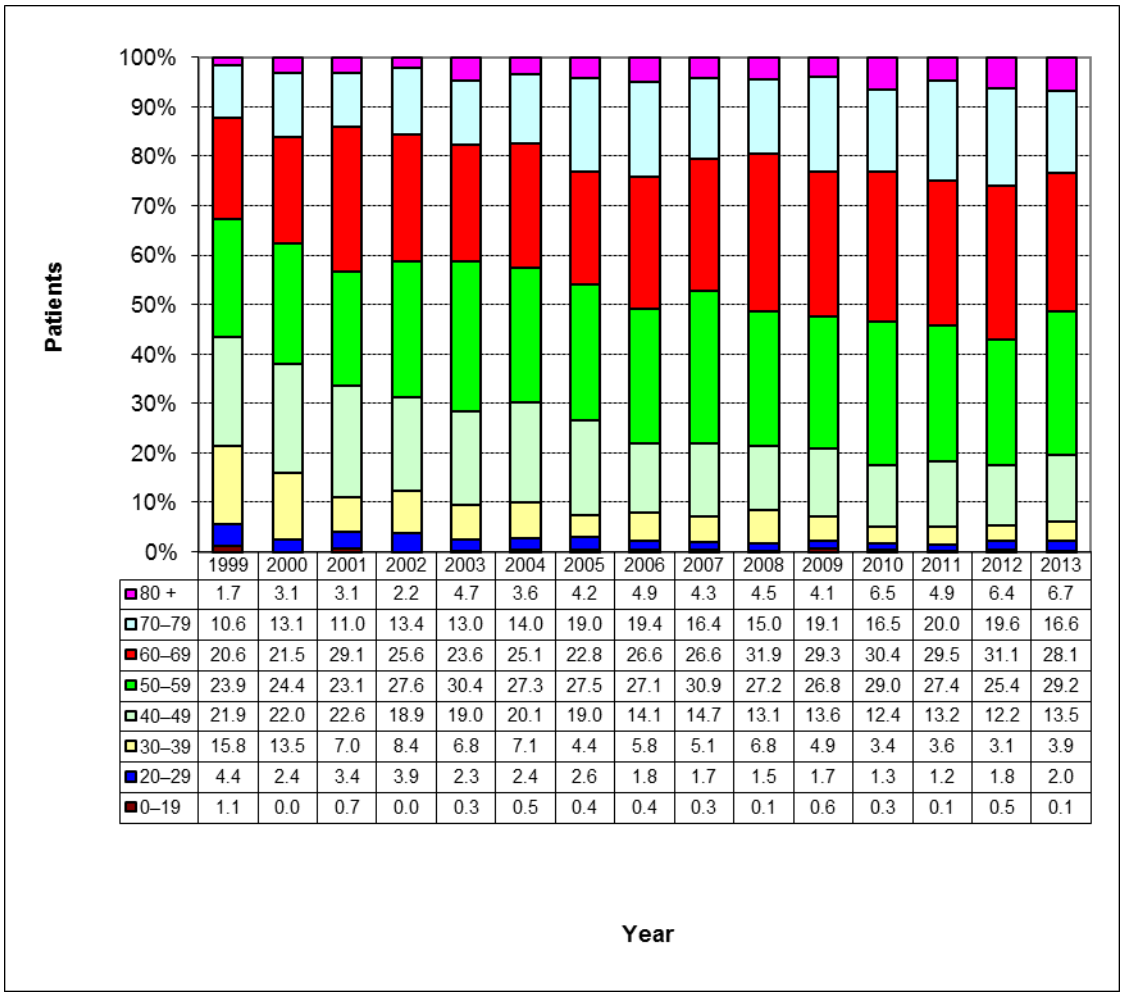
Table 8.7.2.1: INCIDENT HD PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	2	0.4	2	0.6	4	0.5
20–29	4	0.9	10	3.0	14	1.8
30–39	15	3.3	9	2.7	24	3.1
40–49	53	11.8	43	12.8	96	12.2
50–59	129	28.7	70	20.9	199	25.4
60–69	140	31.1	104	31.0	244	31.1
70–79	85	18.9	69	20.6	154	19.6
80 +	22	4.9	28	8.4	50	6.4
All Age Groups	**450**	**100**	**335**	**100**	**785**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	1	0.2	0	0.0	1	0.1
20–29	8	1.8	8	2.3	16	2.0
30–39	16	3.5	15	4.3	31	3.9
40–49	67	14.7	41	11.9	108	13.5
50–59	153	33.5	81	23.5	234	29.2
60–69	120	26.3	105	30.4	225	28.1
70–79	66	14.4	67	19.4	133	16.6
80 +	26	5.7	28	8.1	54	6.7
All Age Groups	**457**	**100**	**345**	**100**	**802**	**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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80 +	1.7	3.1	3.1	2.2	4.7	3.6	4.2	4.9	4.3	4.5	4.1	6.5	4.9	6.4	6.7
70–79	10.6	13.1	11.0	13.4	13.0	14.0	19.0	19.4	16.4	15.0	19.1	16.5	20.0	19.6	16.6
60–69	20.6	21.5	29.1	25.6	23.6	25.1	22.8	26.6	26.6	31.9	29.3	30.4	29.5	31.1	28.1
50–59	23.9	24.4	23.1	27.6	30.4	27.3	27.5	27.1	30.9	27.2	26.8	29.0	27.4	25.4	29.2
40–49	21.9	22.0	22.6	18.9	19.0	20.1	19.0	14.1	14.7	13.1	13.6	12.4	13.2	12.2	13.5
30–39	15.8	13.5	7.0	8.4	6.8	7.1	4.4	5.8	5.1	6.8	4.9	3.4	3.6	3.1	3.9
20–29	4.4	2.4	3.4	3.9	2.3	2.4	2.6	1.8	1.7	1.5	1.7	1.3	1.2	1.8	2.0
0–19	1.1	0.0	0.7	0.0	0.3	0.5	0.4	0.4	0.3	0.1	0.6	0.3	0.1	0.5	0.1

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

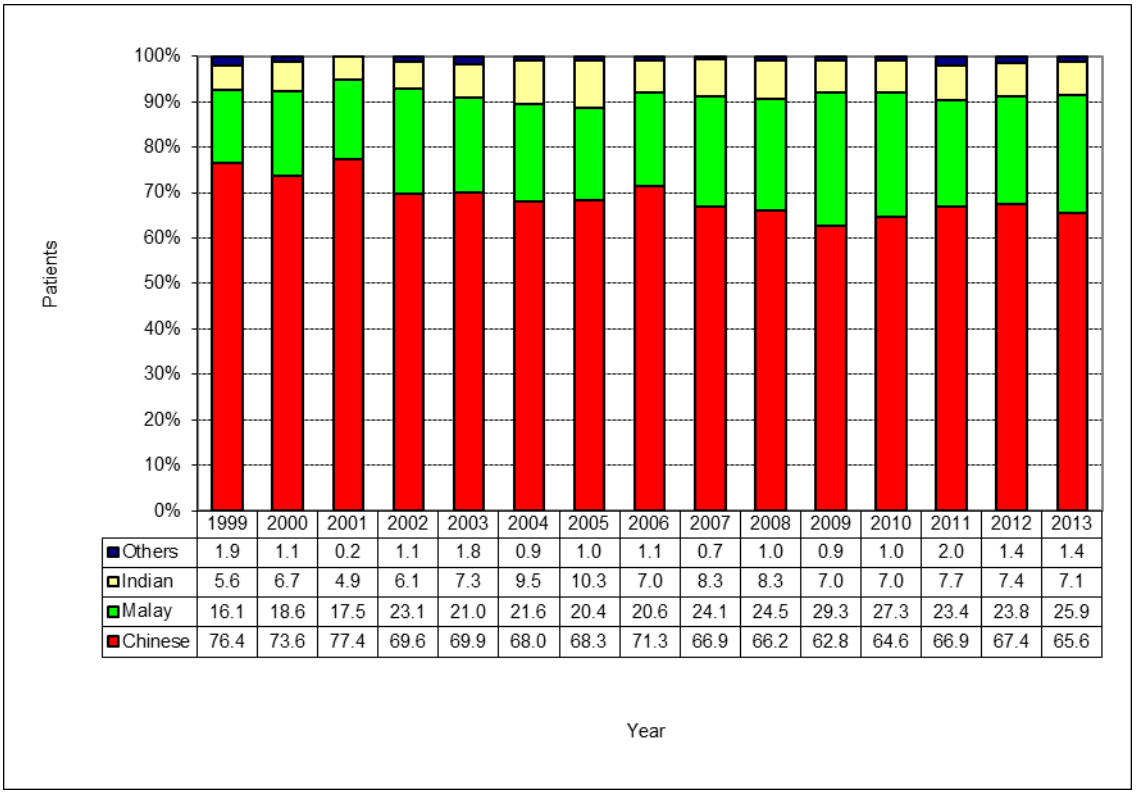
Table 8.7.2.2: INCIDENT HD PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	319	70.9	210	62.7	529	67.4
Malay	88	19.6	99	29.6	187	23.8
Indian	37	8.2	21	6.3	58	7.4
Others	6	1.3	5	1.5	11	1.4
All Ethnic Groups	**450**	**100**	**335**	**100**	**785**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	329	72.0	197	57.1	526	65.6
Malay	94	20.6	114	33.0	208	25.9
Indian	25	5.5	32	9.3	57	7.1
Others	9	2.0	2	0.6	11	1.4
All Ethnic Groups	**457**	**100**	**345**	**100**	**802**	**100**

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

Figure 8.7.2.3: INCIDENT HD PATIENTS BY ETHNIC GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.9	1.1	0.2	1.1	1.8	0.9	1.0	1.1	0.7	1.0	0.9	1.0	2.0	1.4	1.4
Indian	5.6	6.7	4.9	6.1	7.3	9.5	10.3	7.0	8.3	8.3	7.0	7.0	7.7	7.4	7.1
Malay	16.1	18.6	17.5	23.1	21.0	21.6	20.4	20.6	24.1	24.5	29.3	27.3	23.4	23.8	25.9
Chinese	76.4	73.6	77.4	69.6	69.9	68.0	68.3	71.3	66.9	66.2	62.8	64.6	66.9	67.4	65.6

Male incident HD patients outnumbered females in the period 2000 – 2013. See Table 8.7.2.3.

Table 8.7.2.3: INCIDENT HD PATIENTS BY GENDER, 1999 – 2013

YEAR	Male		Female	
	No	%	No	%
1999	174	48.3	186	51.7
2000	227	50.3	224	49.7
2001	260	58.3	186	41.7
2002	203	56.5	156	43.5
2003	206	53.5	179	46.5
2004	226	53.6	196	46.4
2005	262	52.9	233	47.1
2006	310	54.6	258	45.4
2007	330	54.5	275	45.5
2008	379	56.2	295	43.8
2009	357	55.9	282	44.1
2010	351	57.4	260	42.6
2011	470	63.5	270	36.5
2012	450	57.3	335	42.7
2013	457	57.0	345	43.0

8.7.3 Prevalence

The mean age for prevalent HD patients has increased from a mean of 53.7 years old in 1999 to 61.7 years old in 2013. See Figure 8.7.3.1.

Males made up 55.9% in 2012 and 56.2% in 2013. 55.4% were aged 60 years or above in 2012 and 56.7% in 2013. See Table 8.7.3.1.

Figure 8.7.3.1: AGE OF PREVALENT HD PATIENTS, 1999 – 2013

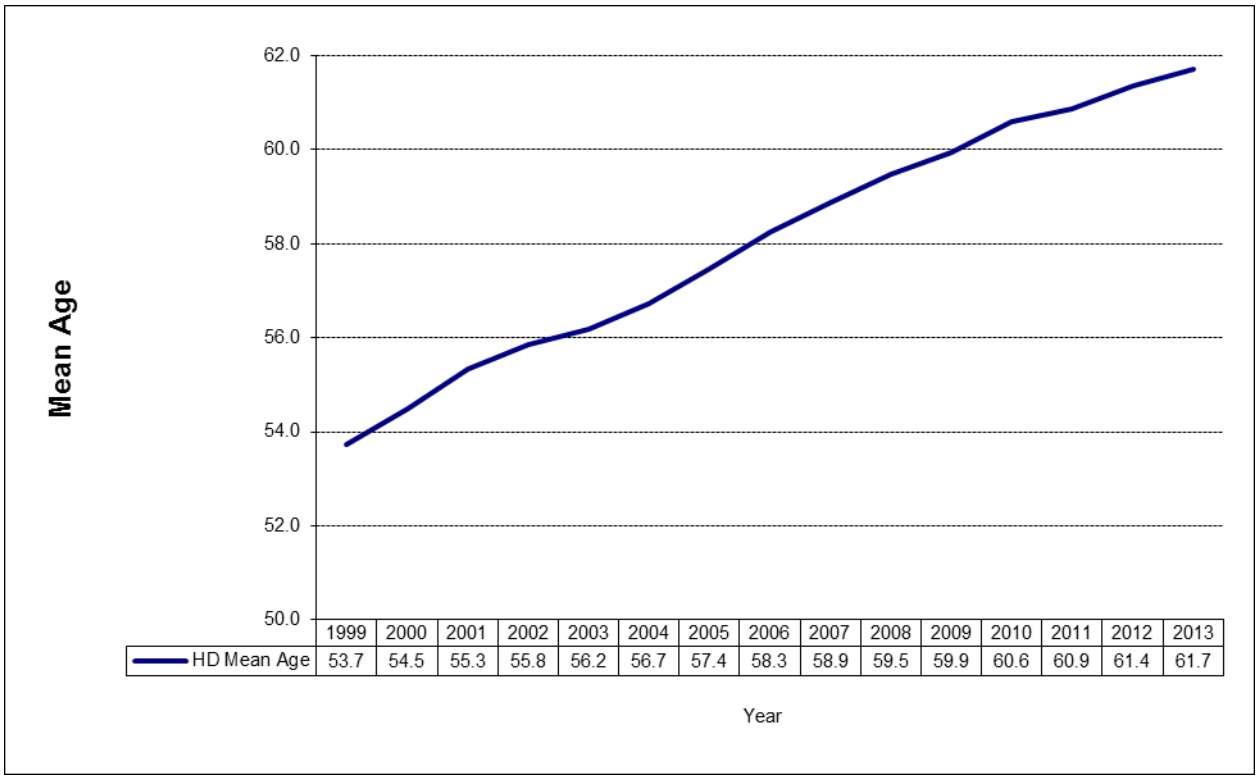


Table 8.7.3.1: PREVALENT HD PATIENTS BY AGE GROUP AND GENDER

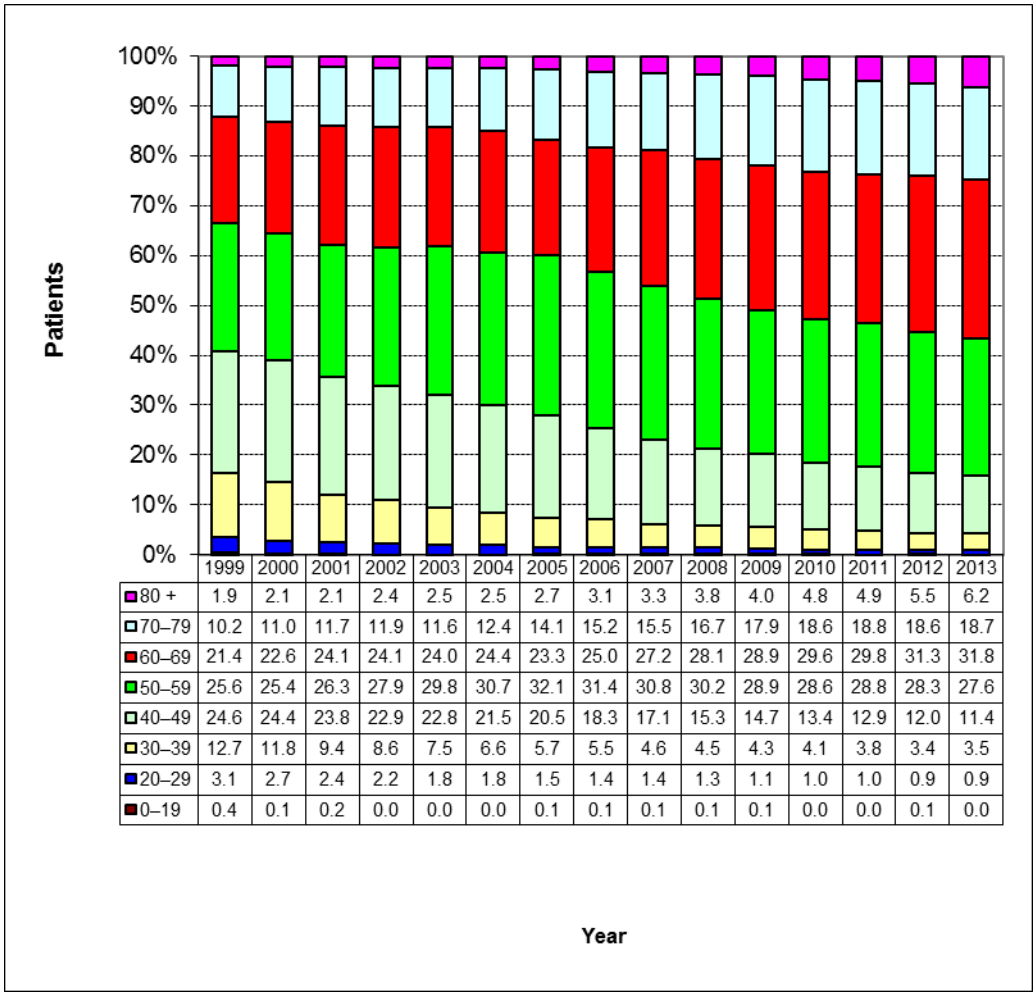
2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	1	0.0	2	0.1	3	0.1
20–29	23	0.9	18	0.9	41	0.9
30–39	98	3.8	58	2.8	156	3.4
40–49	320	12.4	234	11.5	554	12.0
50–59	736	28.6	568	27.9	1304	28.3
60–69	842	32.7	600	29.5	1442	31.3
70–79	426	16.5	431	21.2	857	18.6
80 +	131	5.1	125	6.1	256	5.5
All Age Groups	**2577**	**100**	**2036**	**100**	**4613**	**100**

Table 8.7.3.1: PREVALENT HD PATIENTS BY AGE GROUP AND GENDER

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	1	0.0	0	0.0	1	0.0
20–29	22	0.8	20	0.9	42	0.9
30–39	107	3.9	60	2.8	167	3.5
40–49	325	11.9	229	10.8	554	11.4
50–59	779	28.6	555	26.2	1334	27.6
60–69	885	32.5	653	30.8	1538	31.8
70–79	445	16.4	460	21.7	905	18.7
80 +	156	5.7	143	6.7	299	6.2
All Age Groups	**2720**	**100**	**2120**	**100**	**4840**	**100**

The proportion of existing HD patients were highest in the age groups 50 – 59 and 60 – 69 while the younger age groups showed a decreasing trend through the years from 1999 to 2013. See Figure 8.7.3.2.

Figure 8.7.3.2: PREVALENT HD PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80 +	1.9	2.1	2.1	2.4	2.5	2.5	2.7	3.1	3.3	3.8	4.0	4.8	4.9	5.5	6.2
70–79	10.2	11.0	11.7	11.9	11.6	12.4	14.1	15.2	15.5	16.7	17.9	18.6	18.8	18.6	18.7
60–69	21.4	22.6	24.1	24.1	24.0	24.4	23.3	25.0	27.2	28.1	28.9	29.6	29.8	31.3	31.8
50–59	25.6	25.4	26.3	27.9	29.8	30.7	32.1	31.4	30.8	30.2	28.9	28.6	28.8	28.3	27.6
40–49	24.6	24.4	23.8	22.9	22.8	21.5	20.5	18.3	17.1	15.3	14.7	13.4	12.9	12.0	11.4
30–39	12.7	11.8	9.4	8.6	7.5	6.6	5.7	5.5	4.6	4.5	4.3	4.1	3.8	3.4	3.5
20–29	3.1	2.7	2.4	2.2	1.8	1.8	1.5	1.4	1.4	1.3	1.1	1.0	1.0	0.9	0.9
0–19	0.4	0.1	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0

In 2012, the ethnic composition was as follows: Chinese 67.4%, Malay 24.3%, Indian 7.1% and other ethnic groups 1.2%. See Table 8.7.3.2.

In 2013, the ethnic composition was as follows: Chinese 67.0%, Malay 24.9%, Indian 7.1% and other ethnic groups 1.0%. See Table 8.7.3.2.

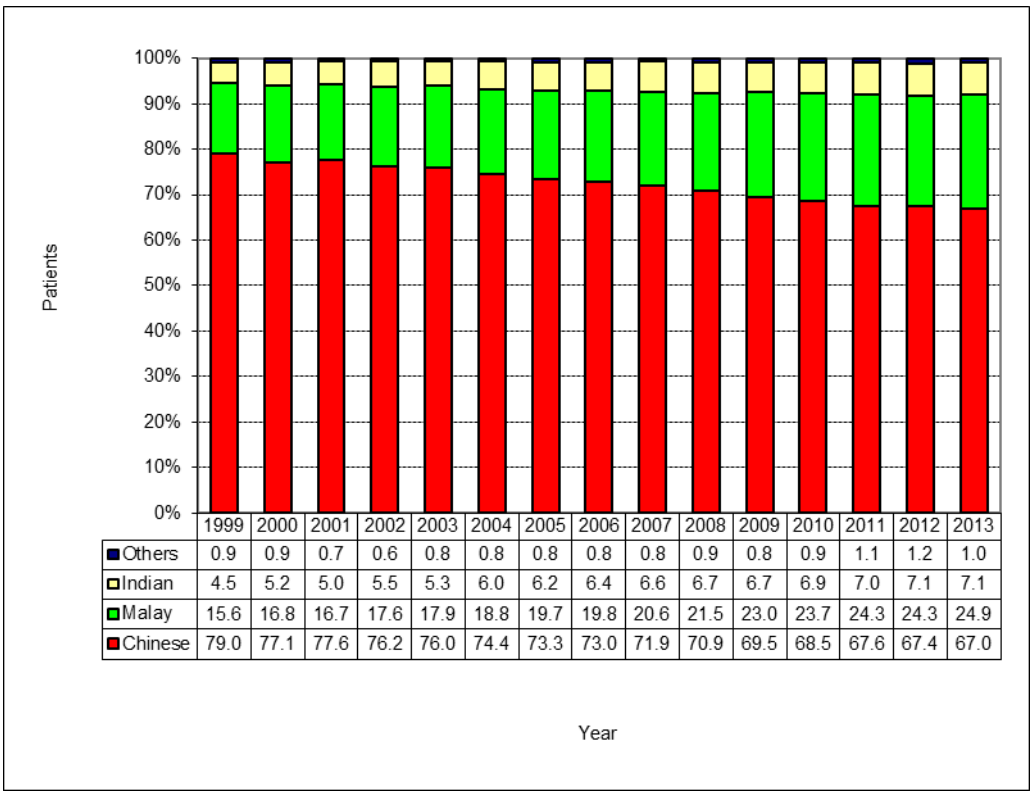
Table 8.7.3.2: PREVALENT HD PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	1822	70.7	1289	63.3	3111	67.4
Malay	523	20.3	599	29.4	1122	24.3
Indian	204	7.9	122	6.0	326	7.1
Others	28	1.1	26	1.3	54	1.2
All Ethnic Groups	**2577**	**100**	**2036**	**100**	**4613**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	1927	70.8	1318	62.2	3245	67.0
Malay	563	20.7	640	30.2	1203	24.9
Indian	201	7.4	141	6.7	342	7.1
Others	29	1.1	21	1.0	50	1.0
All Ethnic Groups	**2720**	**100**	**2120**	**100**	**4840**	**100**

The number of existing Chinese patients on HD declined from 79.0% in 1999 to 67.0% in 2013, 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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	0.9	0.9	0.7	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.9	1.1	1.2	1.0
Indian	4.5	5.2	5.0	5.5	5.3	6.0	6.2	6.4	6.6	6.7	6.7	6.9	7.0	7.1	7.1
Malay	15.6	16.8	16.7	17.6	17.9	18.8	19.7	19.8	20.6	21.5	23.0	23.7	24.3	24.3	24.9
Chinese	79.0	77.1	77.6	76.2	76.0	74.4	73.3	73.0	71.9	70.9	69.5	68.5	67.6	67.4	67.0

The proportion of existing male HD patients was consistently higher than the females for 1999 – 2013. See Table 8.7.3.3.

Table 8.7.3.3: PREVALENT HD PATIENTS BY GENDER, 1999 – 2013

YEAR	Male		Female	
	No	%	No	%
1999	1050	51.1	1005	48.9
2000	1179	50.7	1148	49.3
2001	1274	51.1	1221	48.9
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
2012	2577	55.9	2036	44.1
2013	2720	56.2	2120	43.8

8.7.4 Aetiology of Renal Failure

DN was the aetiology of renal failure in 65.7% of incident HD patients in 2012 and 64.8% in 2013. Primary GN was the aetiology of renal failure in 15.7% of incident HD patients in 2012 and 15.8% in 2013.

DN was the leading cause of renal failure in prevalent HD patients (48.2% in 2012, 49.6% in 2013) followed by primary GN (30.3% in 2012, 29.0% in 2013). See Table 8.7.4.1.

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

Causes of CKD5	2012				2013			
	Incident		Prevalent		Incident		Prevalent	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	516	65.7	2223	48.2	520	64.8	2400	49.6
Primary Glomerulonephritis (GN)	123	15.7	1397	30.3	127	15.8	1403	29.0
Autoimmune Disease/GN with Systemic Manifestations	12	1.5	87	1.9	9	1.1	86	1.8
Hypertension and Renovascular Disease	85	10.8	510	11.1	92	11.5	547	11.3
Polycystic Kidney Disease / Other Cystic Diseases	21	2.7	153	3.3	26	3.2	166	3.4
Vesicoureteric Reflex / Chronic Pyelonephritis	0	0.0	22	0.5	2	0.2	21	0.4
Obstruction	9	1.1	45	1.0	10	1.2	53	1.1
Stone Disease	1	0.1	12	0.3	0	0.0	11	0.2
Miscellaneous	16	2.0	99	2.1	14	1.7	93	1.9
Unknown	2	0.3	65	1.4	2	0.2	60	1.2
All Causes of ESRD	**785**	**100**	**4613**	**100**	**802**	**100**	**4840**	**100**

8.7.5 Service Provider

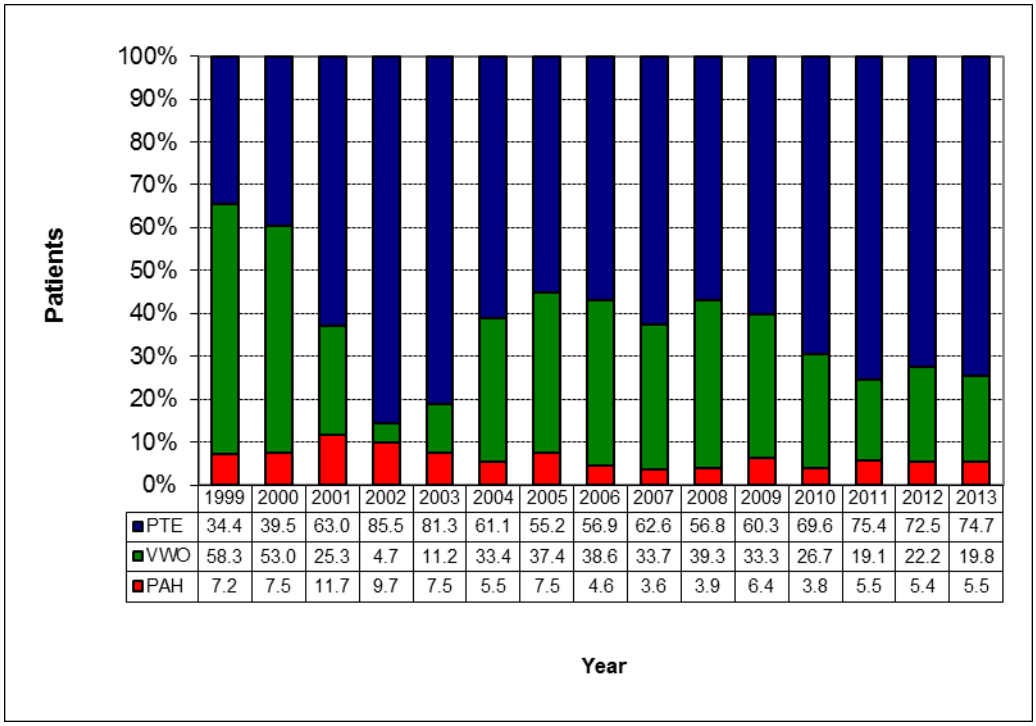
While the majority of new HD patients (72.5% in 2012, 74.7% in 2013) were dialysed in PTE, most prevalent HD patients (61.7% in 2012, 60.7% in 2013) were dialysed in centres run by VWOs. This probably reflects the patients' preferred choice for subsidised dialysis. See Table 8.7.5.1.

Table 8.7.5.1: INCIDENT AND PREVALENT HD PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER	2012				2013			
	New	%	Prevalent	%	New	%	Prevalent	%
PAH	42	5.4	108	2.3	44	5.5	86	1.8
VWO	174	22.2	2845	61.7	159	19.8	2940	60.7
PTE	569	72.5	1660	36.0	599	74.7	1814	37.5
All Providers	**785**	**100**	**4613**	**100**	**802**	**100**	**4840**	**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 55.2% to 81.3% subsequently. Intake of new HD patients to VWOs 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.

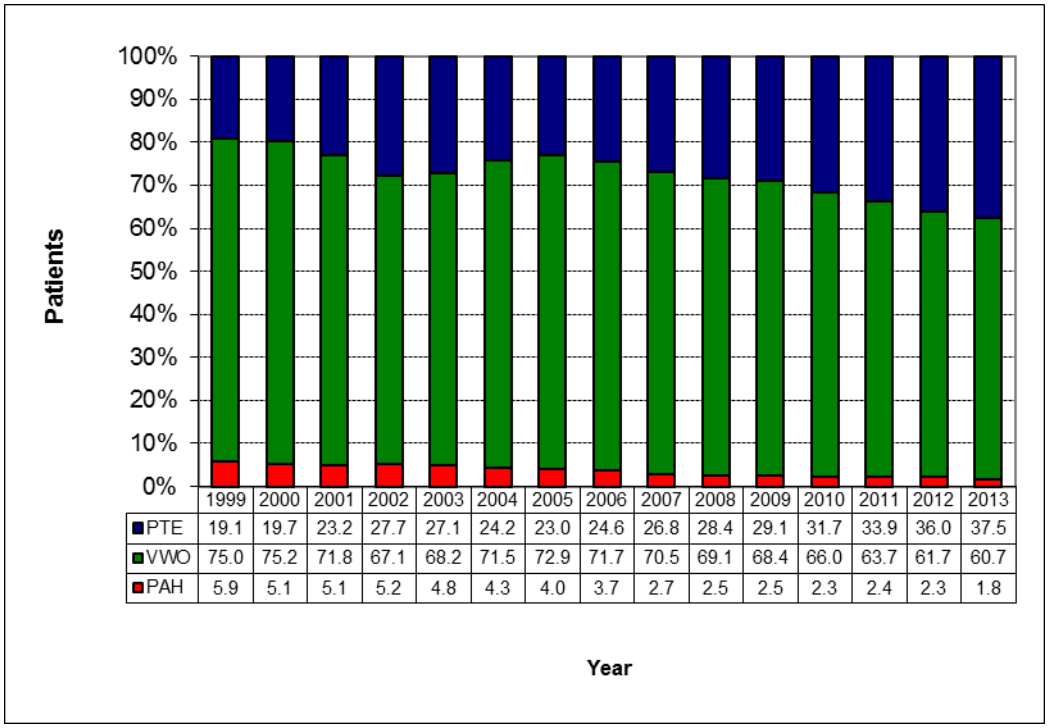
Figure 8.7.5.1: INCIDENT HD PATIENTS BY SERVICE PROVIDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	34.4	39.5	63.0	85.5	81.3	61.1	55.2	56.9	62.6	56.8	60.3	69.6	75.4	72.5	74.7
VWO	58.3	53.0	25.3	4.7	11.2	33.4	37.4	38.6	33.7	39.3	33.3	26.7	19.1	22.2	19.8
PAH	7.2	7.5	11.7	9.7	7.5	5.5	7.5	4.6	3.6	3.9	6.4	3.8	5.5	5.4	5.5

In the period 1999 – 2013, 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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	19.1	19.7	23.2	27.7	27.1	24.2	23.0	24.6	26.8	28.4	29.1	31.7	33.9	36.0	37.5
VWO	75.0	75.2	71.8	67.1	68.2	71.5	72.9	71.7	70.5	69.1	68.4	66.0	63.7	61.7	60.7
PAH	5.9	5.1	5.1	5.2	4.8	4.3	4.0	3.7	2.7	2.5	2.5	2.3	2.4	2.3	1.8

8.7.6 Dialysis Treatment

The majority of prevalent HD patients (97.4% in 2012, 97.6% in 2013) were dialysed three times a week. The proportion of patients who were dialysed three times a week was the highest in the VWO centres (100.0% in 2012, 99.9% in 2013) compared to the PAHs (95.4% in 2012, 93.0% in 2013) and the PTE (93.1% in 2012, 94.2% in 2013). See Table 8.7.6.1.

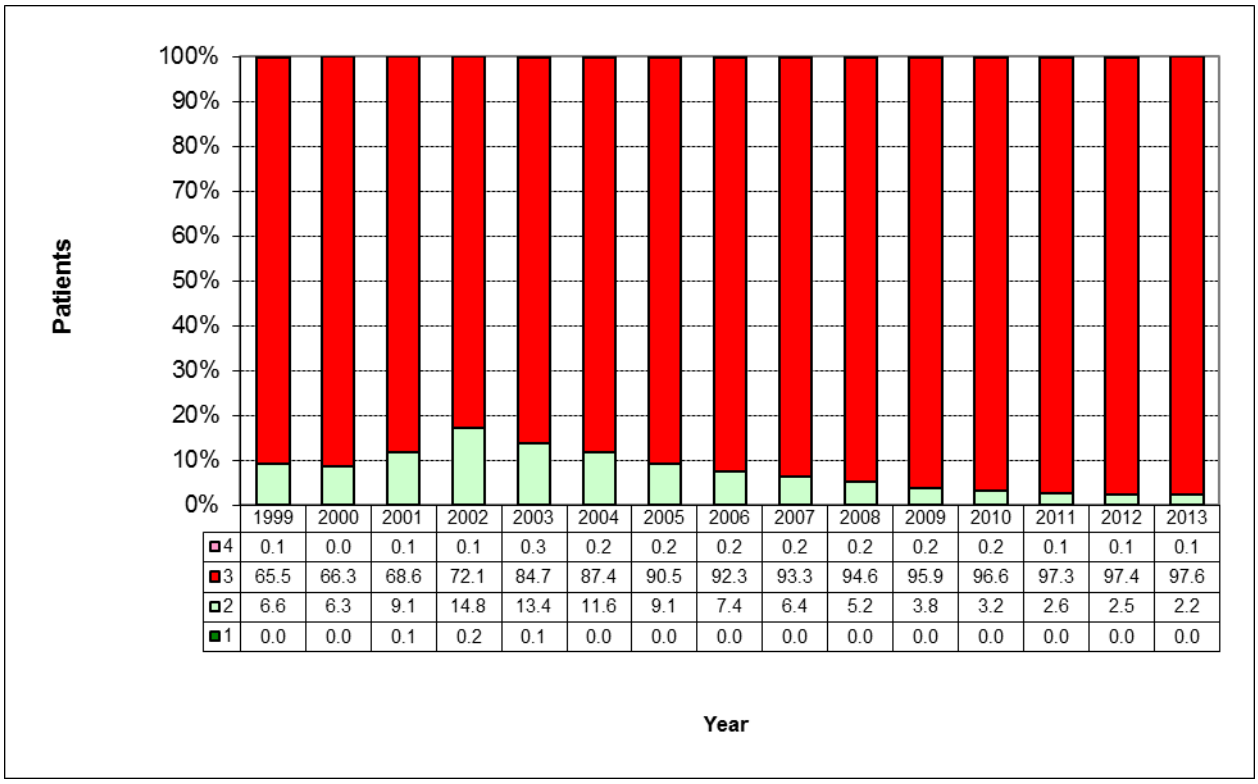
Table 8.7.6.1: PREVALENT HD PATIENTS BY FREQUENCY OF HD AND SERVICE PROVIDER

2012 SESSION PER WEEK	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
1	0	0.0	0	0.0	1	0.1	1	0.0
2	2	1.9	1	0.0	111	6.7	114	2.5
3	103	95.4	2844	100.0	1545	93.1	4492	97.4
4	3	2.8	0	0.0	3	0.2	6	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	**108**	**100**	**2845**	**100**	**1660**	**100**	**4613**	**100**

2013 SESSION PER WEEK	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
1	0	0.0	0	0.0	1	0.1	1	0.0
2	3	3.5	2	0.1	103	5.7	108	2.2
3	80	93.0	2938	99.9	1708	94.2	4726	97.6
4	3	3.5	0	0.0	2	0.1	5	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	**86**	**100**	**2940**	**100**	**1814**	**100**	**4840**	**100**

The number of patients dialysing 3 times per week increased over the years in 1999-2013. See Figure 8.7.6.1.

Figure 8.7.6.1: PREVALENT HD PATIENTS BY FREQUENCY OF HD, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
4	0.1	0.0	0.1	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
3	65.5	66.3	68.6	72.1	84.7	87.4	90.5	92.3	93.3	94.6	95.9	96.6	97.3	97.4	97.6
2	6.6	6.3	9.1	14.8	13.4	11.6	9.1	7.4	6.4	5.2	3.8	3.2	2.6	2.5	2.2
1	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Of all the patients dialysing three times a week, majority of them (83.2% in 2012, 84.0% in 2013) dialysed between 3.5 to 4.0 hours. 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

2012 NUMBER OF HOURS PER SESSION	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
≤3.0	5	4.9	5	0.2	1	0.1	11	0.2
>3.0–3.5	2	1.9	94	3.3	13	0.8	109	2.4
>3.5–4.0	95	92.2	2123	74.6	1518	98.3	3736	83.2
>4.0–4.5	1	1.0	574	20.2	12	0.8	587	13.1
>4.5	0	0.0	48	1.7	1	0.1	49	1.1
Unknown	0	0.0	0	0.0	0	0.0	0	0.0
All Patients	**103**	**100**	**2844**	**100**	**1545**	**100**	**4492**	**100**

2013 NUMBER OF HOURS PER SESSION	PAH		VWO		PTE		ALL	
	No	%	No	%	No	%	No	%
≤3.0	0	0.0	4	0.1	0	0.0	4	0.1
>3.0–3.5	0	0.0	90	3.1	11	0.6	101	2.1
>3.5–4.0	80	100.0	2213	75.3	1679	98.3	3972	84.0
>4.0–4.5	0	0.0	590	20.1	16	0.9	606	12.8
>4.5	0	0.0	41	1.4	2	0.1	43	0.9
Unknown	0	0.0	0	0.0	0	0.0	0	0.0
All Patients	**80**	**100**	**2938**	**100**	**1708**	**100**	**4726**	**100**

8.8 Peritoneal Dialysis

8.8.1 Incidence and Prevalence

During 2012, there were 136 new PD patients who survived 90 days after starting on PD (CR 35.6 pmp; ASR 26.3 pmp). 9 patients were transplanted. There were 123 deaths.

During 2013, there were 173 new PD patients who survived 90 days after starting on PD (CR 45.0 pmp; ASR 30.8 pmp). 12 patients were transplanted. There were 117 deaths.

The prevalent PD population numbered 631 patients (CR 165.3 pmp; ASR 119.9 pmp) in 2012 and 681 patients (CR 177.1 pmp; ASR 123.7 pmp) in 2013. See Table 8.8.1.1. This comprised 12.0% of the prevalent dialysis population in 2012 and 12.3% in 2013. See Figure 8.3.2.1.

Table 8.8.1.1: INCIDENT AND PREVALENT PD PATIENTS

	2012				2013			
	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	136	9	123	631	173	12	117	681
CR*	35.6	2.4	32.2	165.3	45.0	3.1	30.4	177.1
ASR*	26.3	-	21.8	119.9	30.8	-	20.0	123.7

* per million resident population

8.8.1.1 Incidence

Of the new patients in 2012, 46.3% (63 out of 136) were males, unlike the higher proportion in HD patients. Most patients were aged 60 years and above. Similarly, of the new patients in 2012, 49.1% (85 out of173) were males with a mean age of 62.3 years. See Table 8.8.1.1.1.

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 – 2013

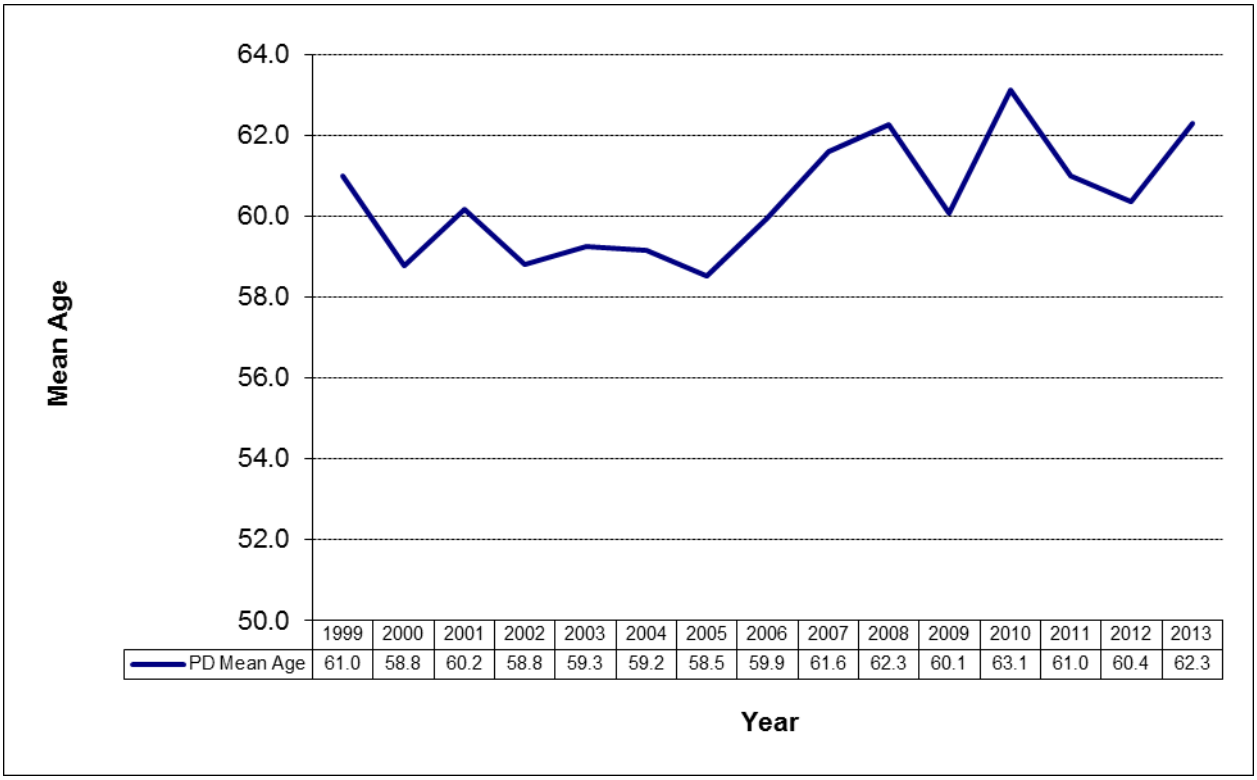


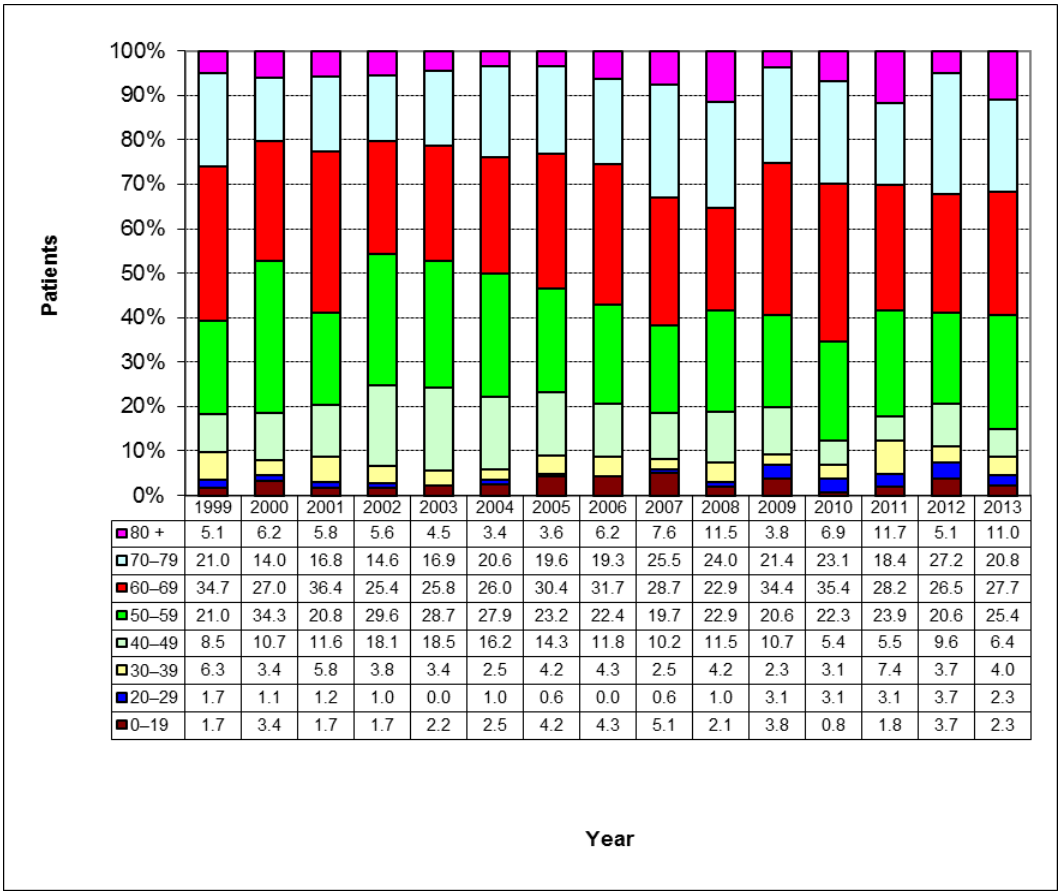
Table 8.8.1.1.1: INCIDENT PD PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	4	6.3	1	1.4	5	3.7
20–29	2	3.2	3	4.1	5	3.7
30–39	4	6.3	1	1.4	5	3.7
40–49	7	11.1	6	8.2	13	9.6
50–59	16	25.4	12	16.4	28	20.6
60–69	16	25.4	20	27.4	36	26.5
70–79	14	22.2	23	31.5	37	27.2
80 +	0	0.0	7	9.6	7	5.1
All Age Groups	**63**	**100**	**73**	**100**	**136**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	3	3.5	1	1.1	4	2.3
20–29	2	2.4	2	2.3	4	2.3
30–39	3	3.5	4	4.5	7	4.0
40–49	5	5.9	6	6.8	11	6.4
50–59	20	23.5	24	27.3	44	25.4
60–69	25	29.4	23	26.1	48	27.7
70–79	17	20.0	19	21.6	36	20.8
80 +	10	11.8	9	10.2	19	11.0
All Age Groups	**85**	**100**	**88**	**100**	**173**	**100**

More than 50% of the of new PD patients were in the age groups 50 – 59 years and 60 – 69 years in 1999 – 2013. See Figure 8.8.1.1.2.

Figure 8.8.1.1.2: INCIDENT PD PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80 +	5.1	6.2	5.8	5.6	4.5	3.4	3.6	6.2	7.6	11.5	3.8	6.9	11.7	5.1	11.0
70–79	21.0	14.0	16.8	14.6	16.9	20.6	19.6	19.3	25.5	24.0	21.4	23.1	18.4	27.2	20.8
60–69	34.7	27.0	36.4	25.4	25.8	26.0	30.4	31.7	28.7	22.9	34.4	35.4	28.2	26.5	27.7
50–59	21.0	34.3	20.8	29.6	28.7	27.9	23.2	22.4	19.7	22.9	20.6	22.3	23.9	20.6	25.4
40–49	8.5	10.7	11.6	18.1	18.5	16.2	14.3	11.8	10.2	11.5	10.7	5.4	5.5	9.6	6.4
30–39	6.3	3.4	5.8	3.8	3.4	2.5	4.2	4.3	2.5	4.2	2.3	3.1	7.4	3.7	4.0
20–29	1.7	1.1	1.2	1.0	0.0	1.0	0.6	0.0	0.6	1.0	3.1	3.1	3.1	3.7	2.3
0–19	1.7	3.4	1.7	1.7	2.2	2.5	4.2	4.3	5.1	2.1	3.8	0.8	1.8	3.7	2.3

In the incident PD population, the majority were Chinese (64.7% in 2012, 76.3% in 2013). The proportion of Malays was higher than the general population (28.7% in 2012, 17.3% in 2013). See Table 8.8.1.1.2.

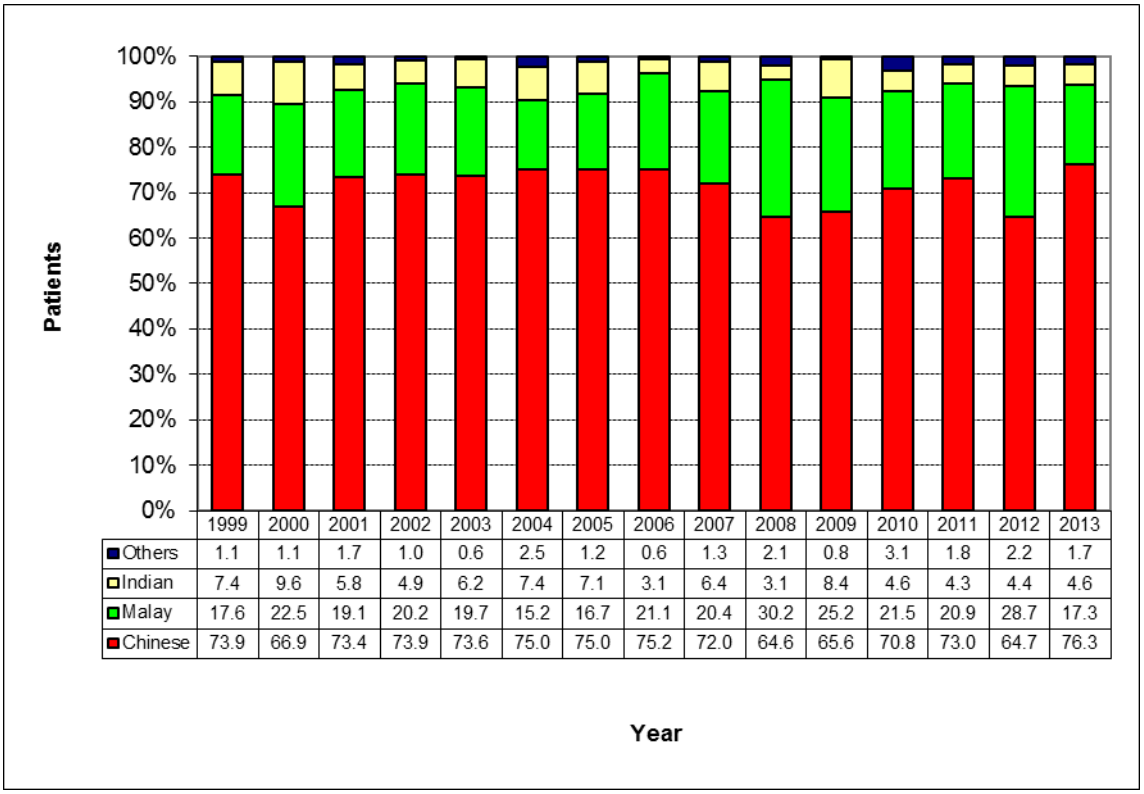
Table 8.8.1.1.2: INCIDENT PD PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	40	63.5	48	65.8	88	64.7
Malay	20	31.7	19	26.0	39	28.7
Indian	2	3.2	4	5.5	6	4.4
Others	1	1.6	2	2.7	3	2.2
All Ethnic Groups	**63**	**100**	**73**	**100**	**136**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	70	82.4	62	70.5	132	76.3
Malay	11	12.9	19	21.6	30	17.3
Indian	2	2.4	6	6.8	8	4.6
Others	2	2.4	1	1.1	3	1.7
All Ethnic Groups	**85**	**100**	**88**	**100**	**173**	**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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.1	1.1	1.7	1.0	0.6	2.5	1.2	0.6	1.3	2.1	0.8	3.1	1.8	2.2	1.7
Indian	7.4	9.6	5.8	4.9	6.2	7.4	7.1	3.1	6.4	3.1	8.4	4.6	4.3	4.4	4.6
Malay	17.6	22.5	19.1	20.2	19.7	15.2	16.7	21.1	20.4	30.2	25.2	21.5	20.9	28.7	17.3
Chinese	73.9	66.9	73.4	73.9	73.6	75.0	75.0	75.2	72.0	64.6	65.6	70.8	73.0	64.7	76.3

Females outnumbered males among the incident PD patients in the period 1999–2013 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 – 2013

YEAR	Male		Female	
	No	%	No	%
1999	78	44.3	98	55.7
2000	101	56.7	77	43.3
2001	74	42.8	99	57.2
2002	137	47.7	150	52.3
2003	87	48.9	91	51.1
2004	97	47.5	107	52.5
2005	77	45.8	91	54.2
2006	82	50.9	79	49.1
2007	78	49.7	79	50.3
2008	38	39.6	58	60.4
2009	64	48.9	67	51.1
2010	58	44.6	72	55.4
2011	83	50.9	80	49.1
2012	63	46.3	73	53.7
2013	85	49.1	88	50.9

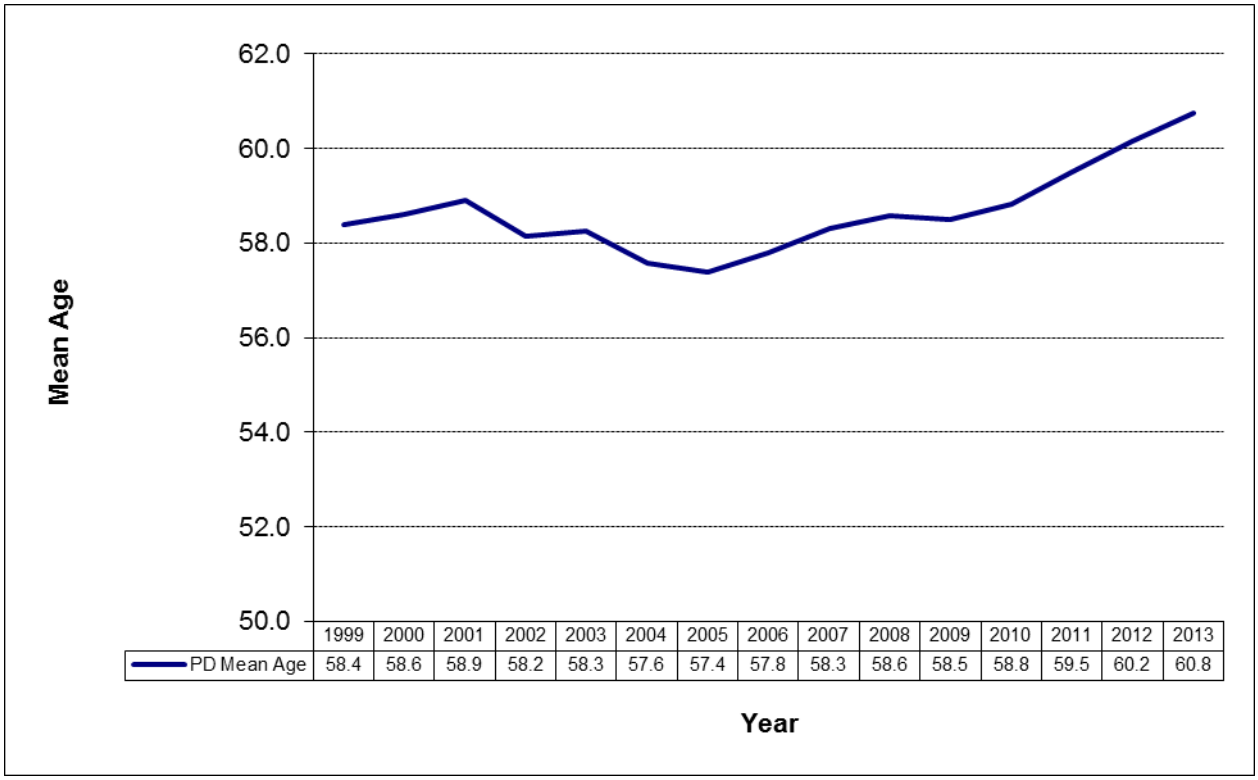
8.8.1.2 Prevalence

There were 631 prevalent patients (CR 165.3 pmp; ASR 119.9 pmp) on PD as of 31 December 2012. Of these, 45.3% (286 patients) were males. The mean age was 60.2 years. See Table 8.8.1.2.2

There were 681 prevalent patients (CR 177.1 pmp; ASR 123.7 pmp) on PD as of 31 December 2013. Of these, 46.5% (317 patients) were males. The mean age was 60.8 years. See Table 8.8.1.2.2

The mean age for prevalent PD patients ranged from 57.4 years old to 60.8 years old in the period 1999 – 2013. See Figure 8.8.1.2.1.

Figure 8.8.1.2.1: AGE OF PREVALENT PD PATIENTS, 1999 – 2013



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.

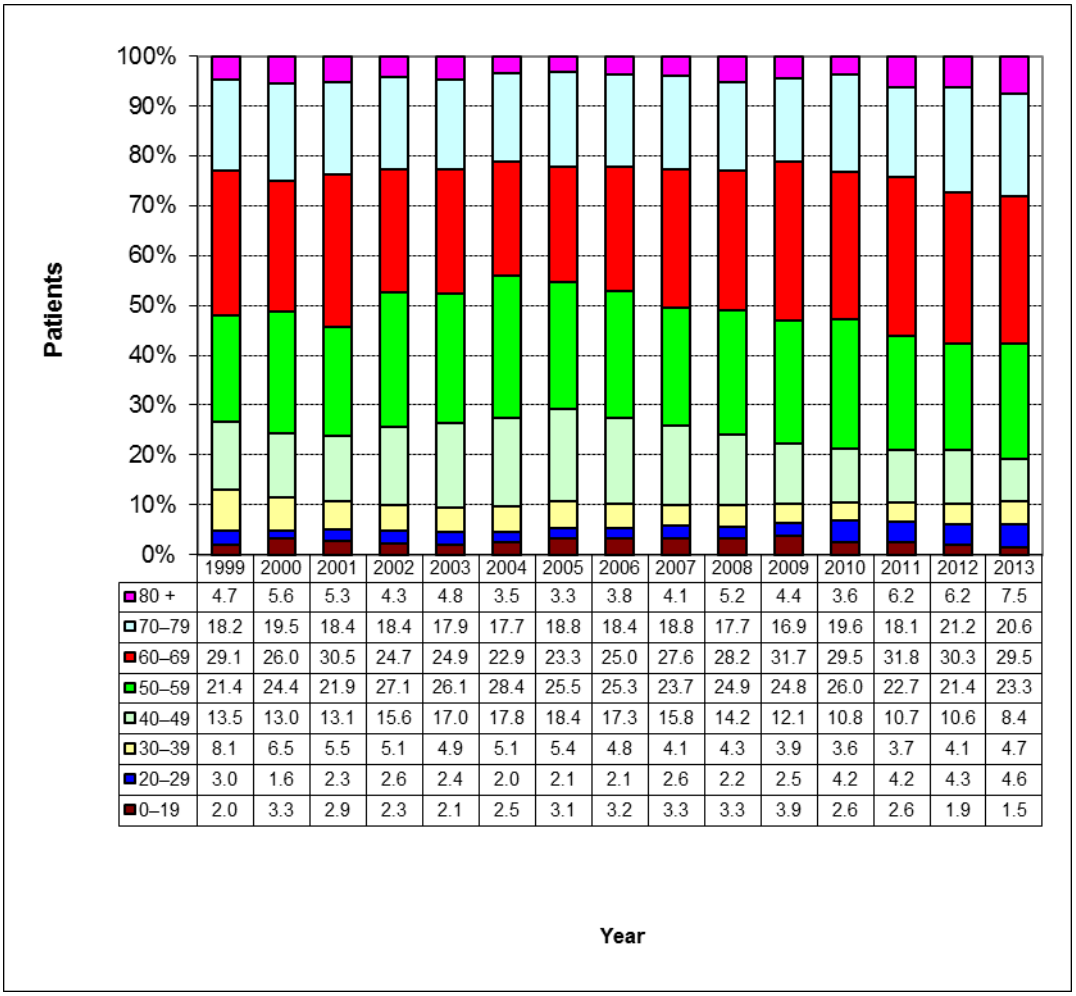
Table 8.8.1.2.2: PREVALENT PD PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	7	2.4	5	1.4	12	1.9
20–29	10	3.5	17	4.9	27	4.3
30–39	13	4.5	13	3.8	26	4.1
40–49	26	9.1	41	11.9	67	10.6
50–59	64	22.4	71	20.6	135	21.4
60–69	96	33.6	95	27.5	191	30.3
70–79	55	19.2	79	22.9	134	21.2
80 +	15	5.2	24	7.0	39	6.2
All Age Groups	**286**	**100**	**345**	**100**	**631**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	5	1.6	5	1.4	10	1.5
20–29	13	4.1	18	4.9	31	4.6
30–39	17	5.4	15	4.1	32	4.7
40–49	23	7.3	34	9.3	57	8.4
50–59	65	20.5	94	25.8	159	23.3
60–69	104	32.8	97	26.6	201	29.5
70–79	67	21.1	73	20.1	140	20.6
80 +	23	7.3	28	7.7	51	7.5
All Age Groups	**317**	**100**	**364**	**100**	**681**	**100**

As with incident PD patients, the highest proportion of existing PD patients was in the age group 60 – 69 years old. See Figure 8.8.1.2.2.

Figure 8.8.1.2.2: PREVALENT PD PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80 +	4.7	5.6	5.3	4.3	4.8	3.5	3.3	3.8	4.1	5.2	4.4	3.6	6.2	6.2	7.5
70–79	18.2	19.5	18.4	18.4	17.9	17.7	18.8	18.4	18.8	17.7	16.9	19.6	18.1	21.2	20.6
60–69	29.1	26.0	30.5	24.7	24.9	22.9	23.3	25.0	27.6	28.2	31.7	29.5	31.8	30.3	29.5
50–59	21.4	24.4	21.9	27.1	26.1	28.4	25.5	25.3	23.7	24.9	24.8	26.0	22.7	21.4	23.3
40–49	13.5	13.0	13.1	15.6	17.0	17.8	18.4	17.3	15.8	14.2	12.1	10.8	10.7	10.6	8.4
30–39	8.1	6.5	5.5	5.1	4.9	5.1	5.4	4.8	4.1	4.3	3.9	3.6	3.7	4.1	4.7
20–29	3.0	1.6	2.3	2.6	2.4	2.0	2.1	2.1	2.6	2.2	2.5	4.2	4.2	4.3	4.6
0–19	2.0	3.3	2.9	2.3	2.1	2.5	3.1	3.2	3.3	3.3	3.9	2.6	2.6	1.9	1.5

In 2012, the majority of the patients were Chinese (71.0%), followed by Malays (21.9%), Indians (5.1%) and other races (2.1%). See Table 8.8.1.2.3.

This was similar for 2013 where the majority of the patients were Chinese (72.8%), followed by Malays (20.4%), Indians (5.0%) and other races (1.8%). See Table 8.8.1.2.3.

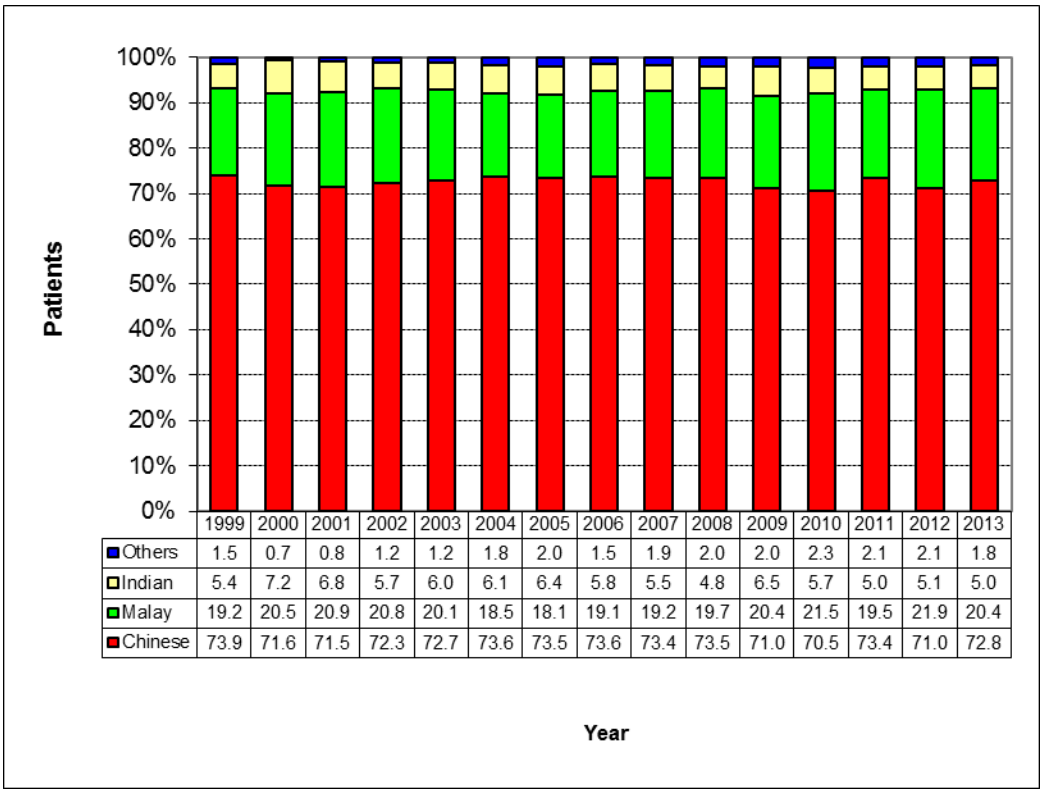
Table 8.8.1.2.3: PREVALENT PD PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	196	68.5	252	73.0	448	71.0
Malay	69	24.1	69	20.0	138	21.9
Indian	16	5.6	16	4.6	32	5.1
Others	5	1.7	8	2.3	13	2.1
All Ethnic Groups	**286**	**100**	**345**	**100**	**631**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	231	72.9	265	72.8	496	72.8
Malay	64	20.2	75	20.6	139	20.4
Indian	15	4.7	19	5.2	34	5.0
Others	7	2.2	5	1.4	12	1.8
All Ethnic Groups	**317**	**100**	**364**	**100**	**681**	**100**

For the period 1999 – 2013, more than 70% of the existing PD patients were Chinese. See Figure 8.8.1.2.3.

Figure 8.8.1.2.3: PREVALENT PD PATIENTS BY ETHNIC GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.5	0.7	0.8	1.2	1.2	1.8	2.0	1.5	1.9	2.0	2.0	2.3	2.1	2.1	1.8
Indian	5.4	7.2	6.8	5.7	6.0	6.1	6.4	5.8	5.5	4.8	6.5	5.7	5.0	5.1	5.0
Malay	19.2	20.5	20.9	20.8	20.1	18.5	18.1	19.1	19.2	19.7	20.4	21.5	19.5	21.9	20.4
Chinese	73.9	71.6	71.5	72.3	72.7	73.6	73.5	73.6	73.4	73.5	71.0	70.5	73.4	71.0	72.8

The proportion of existing female PD patients was consistently higher than their male counterparts for 1999 – 2013. See Table 8.8.1.2.4.

Table 8.8.1.2.4: PREVALENT PD PATIENTS BY GENDER, 1999 – 2013

YEAR	Male		Female	
	No	%	No	%
1999	167	41.1	239	58.9
2000	201	46.7	229	53.3
2001	219	44.9	269	55.1
2002	295	45.2	358	54.8
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
2012	286	45.3	345	54.7
2013	317	46.5	364	53.5

8.8.2 Aetiology of Renal Failure

In 2012, the majority of new patients going onto PD were those with DN (64.7%). DN in the prevalent population, however, accounted for 49.1%. This probably reflects the lower survival rate of patients with DN. Patients with primary GN comprised only 14.7% of the new patients but formed 25.0% of the prevalent PD patients. See Table 8.8.2.1.

In 2013, the majority of new patients going onto PD were those with DN (63.0%). DN in the prevalent population, however, accounted for 50.5%. Patients with primary GN comprised only 20.2% of the new patients but formed 25.1% of the prevalent PD patients. See Table 8.8.2.1.

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

Causes of CKD5	2012				2013			
	Incident		Prevalent		Incident		Prevalent	
	No.	%	No.	%	No.	%	No.	%
Diabetic Nephropathy	88	64.7	310	49.1	109	63.0	344	50.5
Primary Glomerulonephritis (GN)	20	14.7	158	25.0	35	20.2	171	25.1
Autoimmune Disease/GN with Systemic Manifestations	2	1.5	29	4.6	1	0.6	28	4.1
Hypertension and Renovascular Disease	20	14.7	88	13.9	21	12.1	90	13.2
Polycystic Kidney Disease / Other Cystic Diseases	0	0.0	9	1.4	5	2.9	17	2.5
Vesicoureteric Reflex / Chronic Pyelonephritis	0	0.0	4	0.6	0	0.0	4	0.6
Obstruction	0	0.0	4	0.6	1	0.6	2	0.3
Stone Disease	0	0.0	2	0.3	0	0.0	1	0.1
Miscellaneous	4	2.9	18	2.9	1	0.6	17	2.5
Unknown	2	1.5	9	1.4	0	0.0	7	1.0
All Causes of ESRD	**136**	**100**	**631**	**100**	**173**	**100**	**681**	**100**

Figure 8.3.1.4(b) showed the 15-years trend (1999 – 2013) of DN among PD patients.

8.8.3 Service Provider

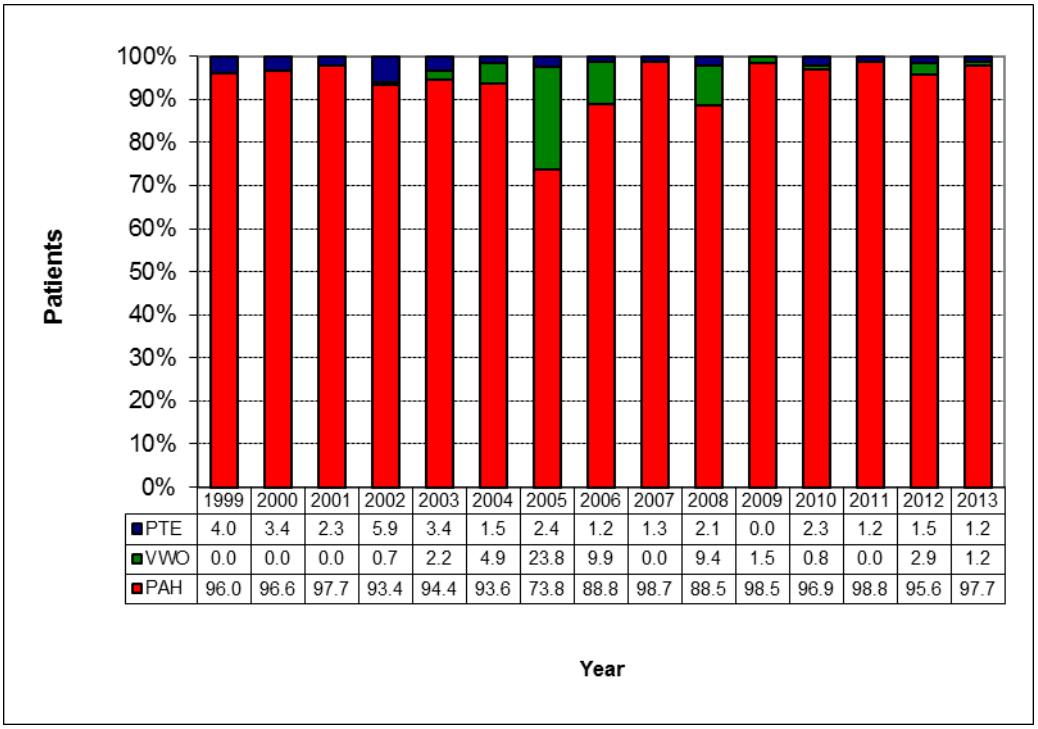
The majority of new PD patients dialysed with the PAHs (95.6% in 2012, 97.7% in 2013) while the remaining were with VWOs (2.9% in 2012, 1.2% in 2013). The distribution of prevalent patients was similar with PAHs caring for the majority (92.2% in 2012, 93.7% in 2013). See Table 8.8.3.1.

Table 8.8.3.1: INCIDENT AND PREVALENT PD PATIENTS BY SERVICE PROVIDER

SERVICE PROVIDER	2012				2013			
	New	%	Prevalent	%	New	%	Prevalent	%
PAH	130	95.6	582	92.2	169	97.7	638	93.7
VWO	4	2.9	42	6.7	2	1.2	36	5.3
PTE	2	1.5	7	1.1	2	1.2	7	1.0
All Providers	**136**	**100**	**631**	**100**	**173**	**100**	**681**	**100**

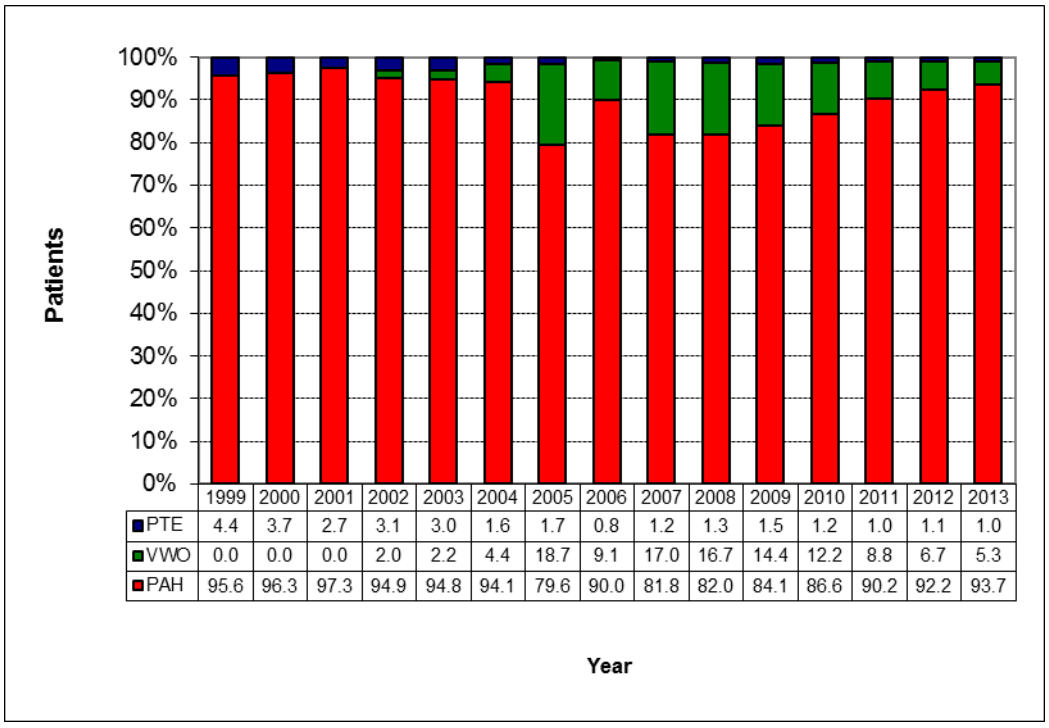
The trends of incident and prevalent patients on PD by service provider from 1999 to 2013 are shown below. See Figures 8.8.3.1 and 8.8.3.2.

Figure 8.8.3.1: INCIDENT PD PATIENTS BY SERVICE PROVIDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	4.0	3.4	2.3	5.9	3.4	1.5	2.4	1.2	1.3	2.1	0.0	2.3	1.2	1.5	1.2
VWO	0.0	0.0	0.0	0.7	2.2	4.9	23.8	9.9	0.0	9.4	1.5	0.8	0.0	2.9	1.2
PAH	96.0	96.6	97.7	93.4	94.4	93.6	73.8	88.8	98.7	88.5	98.5	96.9	98.8	95.6	97.7

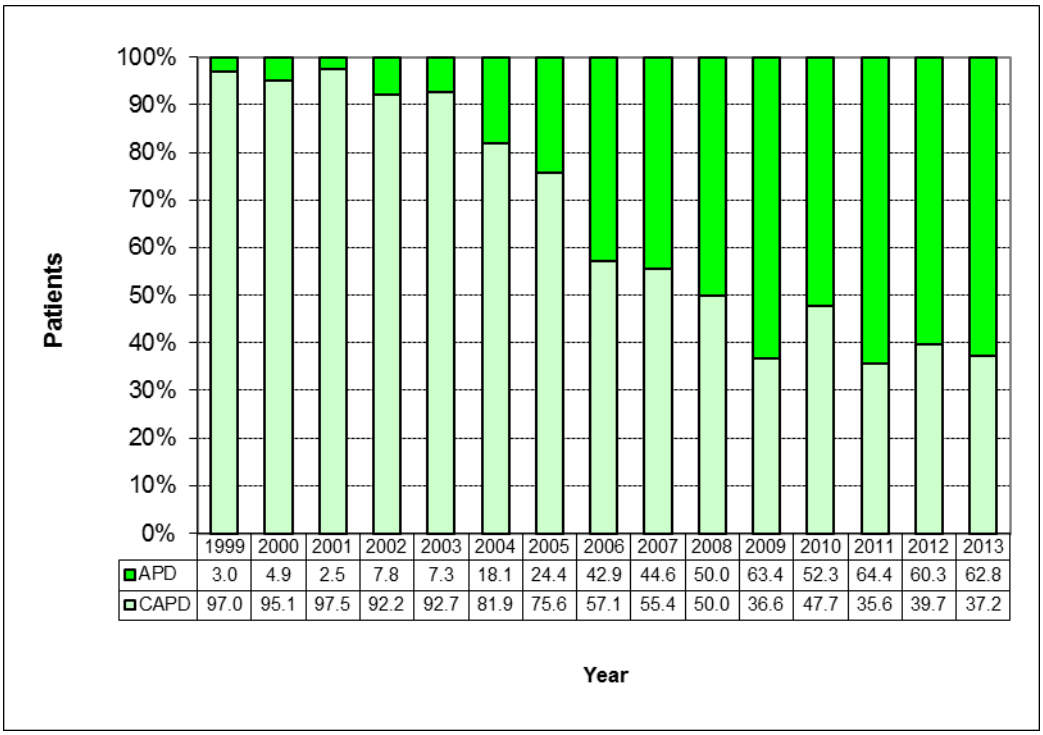
Figure 8.8.3.2: PREVALENT PD PATIENTS BY SERVICE PROVIDER, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
PTE	4.4	3.7	2.7	3.1	3.0	1.6	1.7	0.8	1.2	1.3	1.5	1.2	1.0	1.1	1.0
VWO	0.0	0.0	0.0	2.0	2.2	4.4	18.7	9.1	17.0	16.7	14.4	12.2	8.8	6.7	5.3
PAH	95.6	96.3	97.3	94.9	94.8	94.1	79.6	90.0	81.8	82.0	84.1	86.6	90.2	92.2	93.7

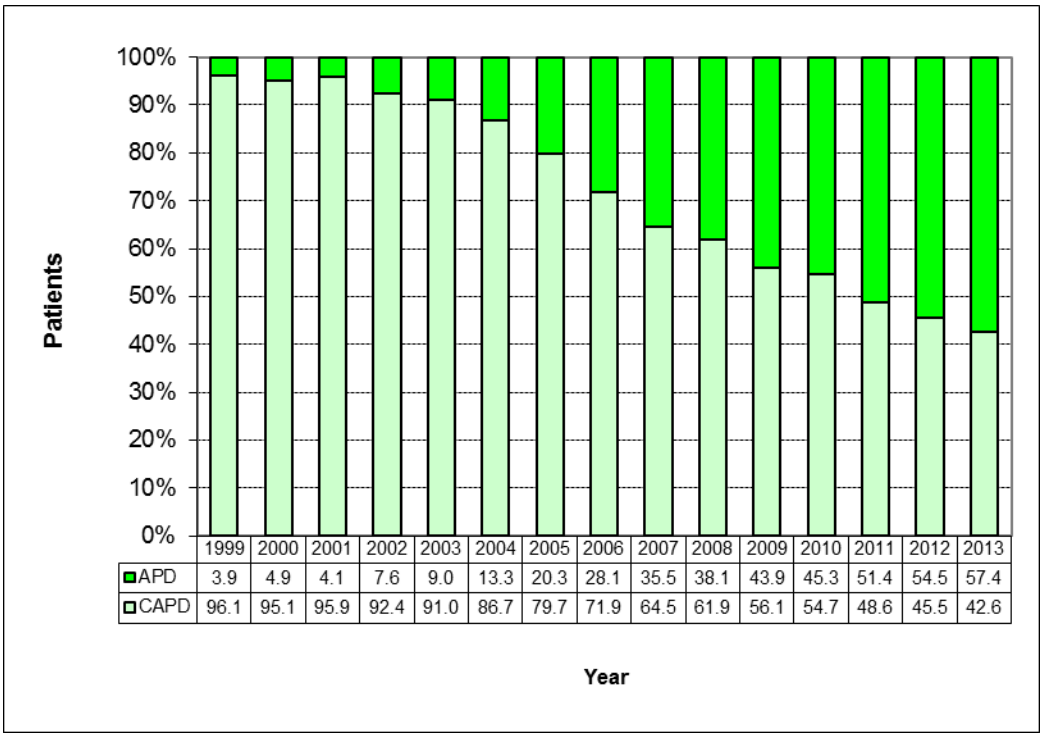
In all years except 2008 to 2013, majority of the incident PD patients were on Continuous Ambulatory Peritoneal Dialysis (CAPD). Correspondingly, there were an increasing proportion of incident and prevalent patients on Automated Peritoneal Dialysis (APD) over the years. See Figures 8.8.3.3 and 8.8.3.4.

Figure 8.8.3.3: INCIDENT CAPD VS APD PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
APD	3.0	4.9	2.5	7.8	7.3	18.1	24.4	42.9	44.6	50.0	63.4	52.3	64.4	60.3	62.8
CAPD	97.0	95.1	97.5	92.2	92.7	81.9	75.6	57.1	55.4	50.0	36.6	47.7	35.6	39.7	37.2

Figure 8.8.3.4: PREVALENT CAPD VS APD PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
APD	3.9	4.9	4.1	7.6	9.0	13.3	20.3	28.1	35.5	38.1	43.9	45.3	51.4	54.5	57.4
CAPD	96.1	95.1	95.9	92.4	91.0	86.7	79.7	71.9	64.5	61.9	56.1	54.7	48.6	45.5	42.6

8.9 Mortality

8.9.1 Demographics

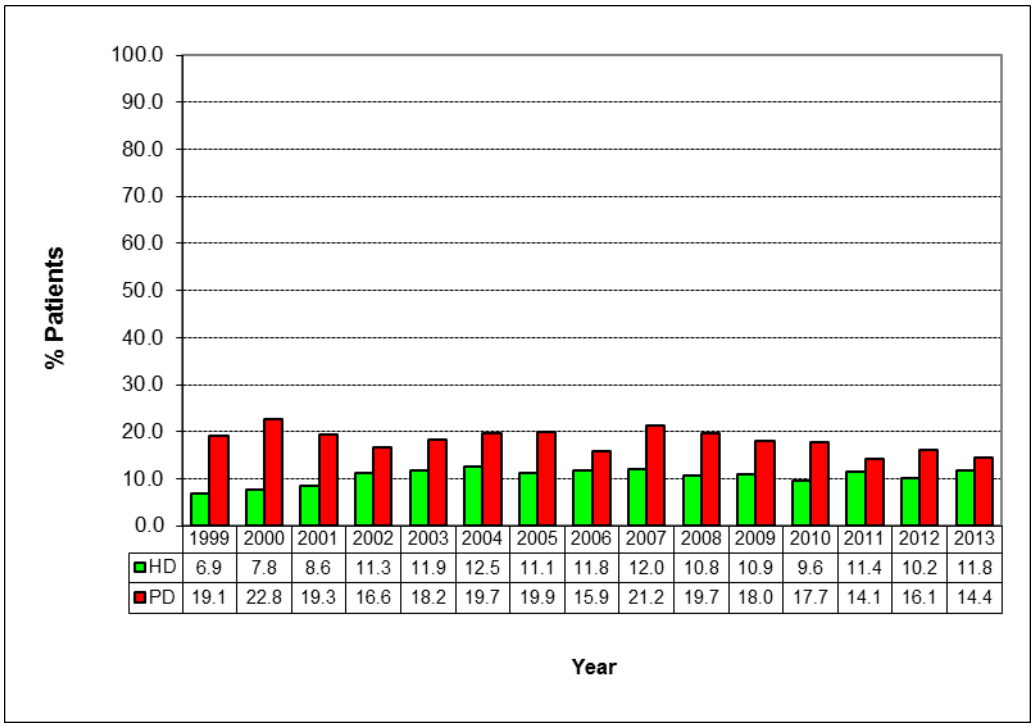
There were 653 deaths amongst dialysis patients in 2012 and 771 deaths in 2013. The death rate, reported as a proportion of all treated patients within the year, was 11.0% in 2012 and 12.1% in 2013. See Table 8.9.1.1.

Table 8.9.1.1: DEMOGRAPHICS

MODALITY	2012		2013	
	No	%	No	%
HD	530	10.2	654	11.8
PD	123	16.1	117	14.4
HD+PD	**653**	**11.0**	**771**	**12.1**

The death rate was higher in PD patients (16.1% in 2012, 14.4% in 2013) compared with HD patients (10.2% in 2012, 11.8% in 2013). The death rate was consistently higher in PD patients than HD patients for the period 1999 to 2013 but the gap started to narrow from 2002 onwards. See Figure 8.9.1.1.

Figure 8.9.1.1: DIALYSIS DEATH BY MODALITY, 1999 – 2013



Many factors contributed to the higher death rate in PD patients. These included older age and co-morbid conditions such as DM and IHD.

The proportion of deaths aged 60 and above was 73.4% in 2012 and 74.0% in 2013. 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

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	0	0.0	0	0.0	0	0.0
20–29	4	1.1	1	0.3	5	0.8
30–39	5	1.4	1	0.3	6	0.9
40–49	23	6.3	17	5.9	40	6.1
50–59	72	19.6	51	17.8	123	18.8
60–69	130	35.4	82	28.7	212	32.5
70–79	93	25.3	86	30.1	179	27.4
80 +	40	10.9	48	16.8	88	13.5
All Age Groups	**367**	**100**	**286**	**100**	**653**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	0	0.0	1	0.3	1	0.1
20–29	0	0.0	1	0.3	1	0.1
30–39	5	1.2	6	1.7	11	1.4
40–49	28	6.6	18	5.2	46	6.0
50–59	80	18.8	61	17.7	141	18.3
60–69	156	36.6	88	25.5	244	31.6
70–79	115	27.0	113	32.8	228	29.6
80 +	42	9.9	57	16.5	99	12.8
All Age Groups	**426**	**100**	**345**	**100**	**771**	**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

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	276	75.2	184	64.3	460	70.4
Malay	73	19.9	77	26.9	150	23.0
Indian	17	4.6	21	7.3	38	5.8
Others	1	0.3	4	1.4	5	0.8
All Ethnic Groups	**367**	**100**	**286**	**100**	**653**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	302	70.9	228	66.1	530	68.7
Malay	82	19.2	88	25.5	170	22.0
Indian	34	8.0	19	5.5	53	6.9
Others	8	1.9	10	2.9	18	2.3
All Ethnic Groups	**426**	**100**	**345**	**100**	**771**	**100**

Majority of the deaths amongst dialysis patients occurred in the age groups 60 - 69 and 70-79 years old for both HD patients and PD patients in 2012 and 2013. See Table 8.9.1.4.

Table 8.9.1.4: DIALYSIS DEATHS BY AGE GROUP AND MODALITY

2012 AGE GROUP	HD		PD		HD+PD	
	No	%	No	%	No	%
0–19	0	0.0	0	0.0	0	0.0
20–29	3	0.6	2	1.6	5	0.8
30–39	6	1.1	0	0.0	6	0.9
40–49	34	6.4	6	4.9	40	6.1
50–59	99	18.7	24	19.5	123	18.8
60–69	170	32.1	42	34.1	212	32.5
70–79	147	27.7	32	26.0	179	27.4
80 +	71	13.4	17	13.8	88	13.5
All Age Groups	**530**	**100**	**123**	**100**	**653**	**100**

2013 AGE GROUP	HD		PD		HD+PD	
	No	%	No	%	No	%
0–19	1	0.2	0	0.0	1	0.1
20–29	0	0.0	1	0.9	1	0.1
30–39	9	1.4	2	1.7	11	1.4
40–49	39	6.0	7	6.0	46	6.0
50–59	124	19.0	17	14.5	141	18.3
60–69	207	31.7	37	31.6	244	31.6
70–79	190	29.1	38	32.5	228	29.6
80 +	84	12.8	15	12.8	99	12.8
All Age Groups	**654**	**100**	**117**	**100**	**771**	**100**

The mean age of death was also similar in both modalities (HD: 66.9 years in 2012 and 67.0 years in 2013; PD: 66.8 years in 2012 and 67.6 years in 2013). The 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		2012					2013				
		Chinese	Malay	Indian	Others	All	Chinese	Malay	Indian	Others	All
HD	Mean	69.0	62.3	60.9	72.2	66.9	68.3	64.3	63.7	63.9	67.0
	Median	69.1	64.3	60.0	73.0	67.2	69.0	63.9	65.6	60.7	67.0
	Std. Dev*	11.3	11.7	10.5	16.6	11.8	11.6	10.7	11.3	11.0	11.5
PD	Mean	67.7	64.4	65.0	53.8	66.8	69.3	63.6	65.3	68.8	67.6
	Median	68.5	65.9	62.9	53.8	67.2	69.9	63.8	64.8	70.9	68.1
	Std. Dev	12.2	8.8	6.3	53.8	11.5	11.9	10.8	12.1	10.7	11.7
HD+PD	Mean	68.7	62.7	61.4	68.5	66.9	68.4	64.2	63.8	65.0	67.1
	Median	69.0	64.4	61.3	65.9	67.2	69.2	63.9	65.4	65.7	67.4
	Std. Dev	11.5	11.3	10.1	16.5	11.7	11.6	10.7	11.3	10.9	11.5

* Std. Dev stands for Standard Deviation

8.9.2 Cause of Death

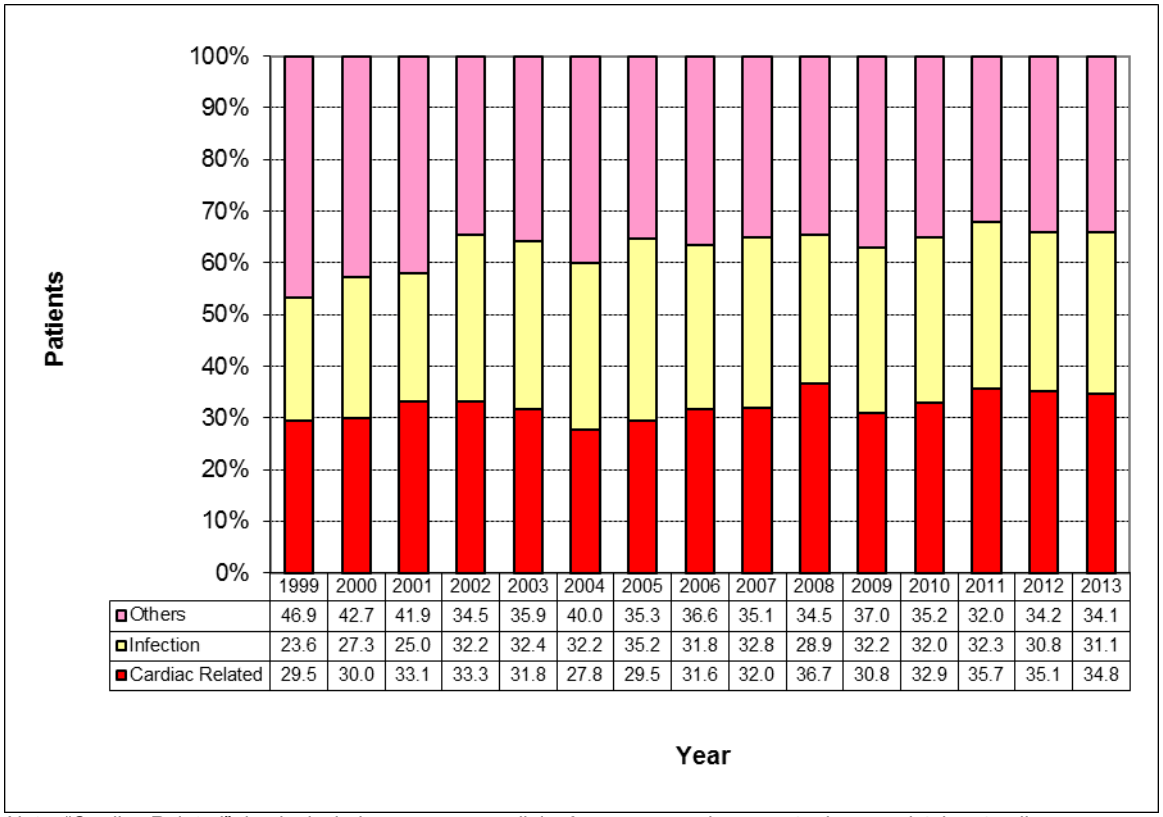
Cardiac events (acute myocardial infarction, acute pulmonary oedema and other cardiac causes) accounted for 35.1% of deaths in 2012 and 34.8% in 2013. Infections accounted for 30.8% in 2012 and 31.1% in 2013. See Table 8.9.2.1.

Table 8.9.2.1: CAUSE OF DEATH IN DIALYSIS PATIENTS

Cause of Death	2012		2013	
	No	%	No	%
Acute Myocardial Infarct (AMI)	87	13.3	87	11.3
Acute Pulmonary Oedema (APO)	1	0.2	2	0.3
Other Cardiac	141	21.6	179	23.2
Cerebrovascular Accident (CVA)	43	6.6	35	4.5
Infections	201	30.8	240	31.1
Liver Failure	3	0.5	3	0.4
Other Haemorrhage	8	1.2	13	1.7
Malignancy	33	5.1	43	5.6
Withdraw dialysis	0	0.0	0	0.0
Uremia	114	17.5	133	17.3
Accidental/Homicide	4	0.6	4	0.5
Other Social	0	0.0	2	0.3
Died at Home	1	0.2	0	0.0
Hyperkalemia (cardiac standstill)	0	0.0	0	0.0
Bleeding from the Gastro-intestinal Tract (BGIT)	0	0.0	4	0.5
Other	16	2.5	24	3.1
Unknown	1	0.2	2	0.3
Total	**653**	**100**	**771**	**100**

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

Figure 8.9.2.1: DIALYSIS DEATH BY INFECTION AND CARDIAC RELATED CAUSES, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	46.9	42.7	41.9	34.5	35.9	40.0	35.3	36.6	35.1	34.5	37.0	35.2	32.0	34.2	34.1
Infection	23.6	27.3	25.0	32.2	32.4	32.2	35.2	31.8	32.8	28.9	32.2	32.0	32.3	30.8	31.1
Cardiac Related	29.5	30.0	33.1	33.3	31.8	27.8	29.5	31.6	32.0	36.7	30.8	32.9	35.7	35.1	34.8

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

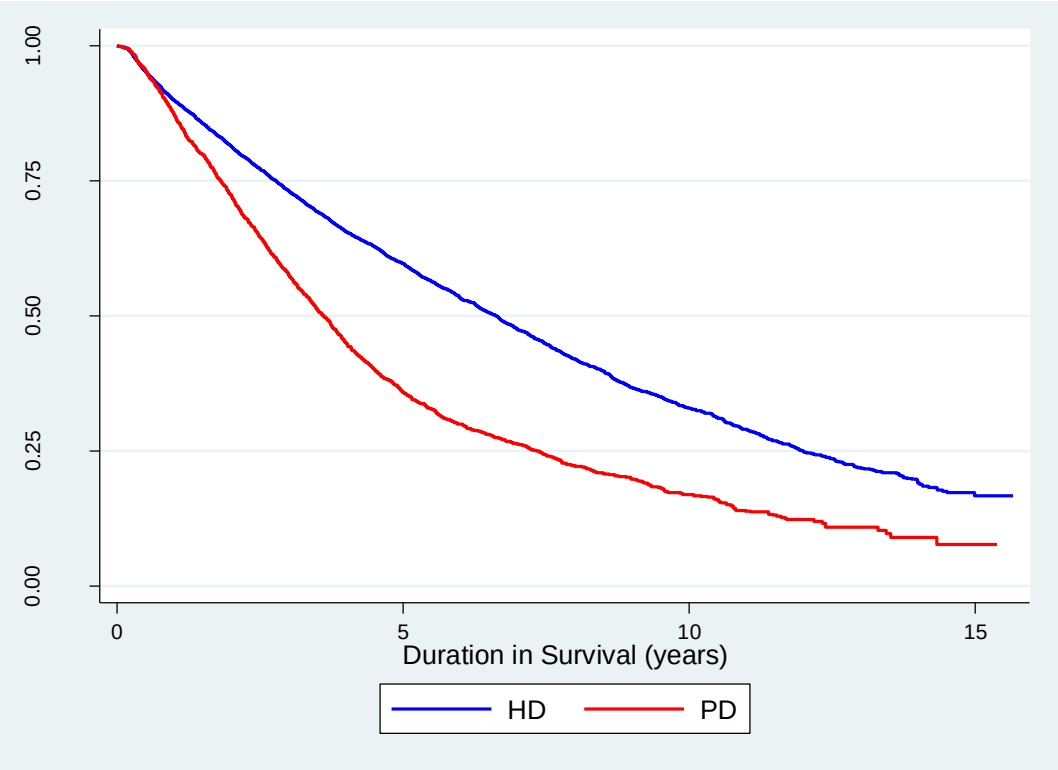
8.9.3 Survival Analysis for Dialysis Patients

The 1- and 5-years survival for patients who survived 90 days after initiation on dialysis was 89.3% and 53.8% respectively. There was 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 – 2013 was 89.9% and that for PD was 87.3%. See Table 8.9.3.1. The median survival was 6.6 years for HD patients and 3.6 years for PD patients.

Table 8.9.3.1: SURVIVAL BY MODALITY, 1999 – 2013

SURVIVAL BY YEAR	1999 – 2013		
	HD	PD	HD + PD
1 year in % (95% C.I.)	89.9 (89.3 – 90.6)	87.3 (86.0 – 88.6)	89.3 (88.7 – 89.9)
5 years in % (95% C.I.)	59.7 (58.5 – 60.9)	35.9 (33.8 – 38.0)	53.8 (52.7 – 54.9)
Median Survival (Years)	6.6	3.6	5.6

Figure 8.9.3.1: SURVIVAL BY MODALITY, 1999 – 2013



There was no significant difference in the 1- and 5- years survival between female and male patients on PD (p=0.89); and also between female and male patients on HD (p=0.29). See Table 8.9.3.2.

Table 8.9.3.2: SURVIVAL BY GENDER AND MODALITY, 1999 – 2013

1999 – 2013	Male			Female		
	PD	HD	HD + PD	PD	HD	HD + PD
1 year survival in % (95% C.I.)	87.3 (85.2 – 89.1)	89.9 (89.0 – 90.7)	89.4 (88.5 – 90.1)	87.4 (85.4 – 89.1)	90.0 (89.0 – 90.9)	89.3 (88.4 – 90.1)
5 years survival in % (95% C.I.)	36.1 (33.0 – 39.2)	59.3 (57.6 – 61.0)	54.1 (52.6 – 55.6)	35.7 (32.8 – 38.6)	60.2 (58.4 – 62.0)	53.4 (51.8 – 55.0)
Median Survival (Years)	3.7	6.5	5.6	3.5	6.7	5.6

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 – 2013

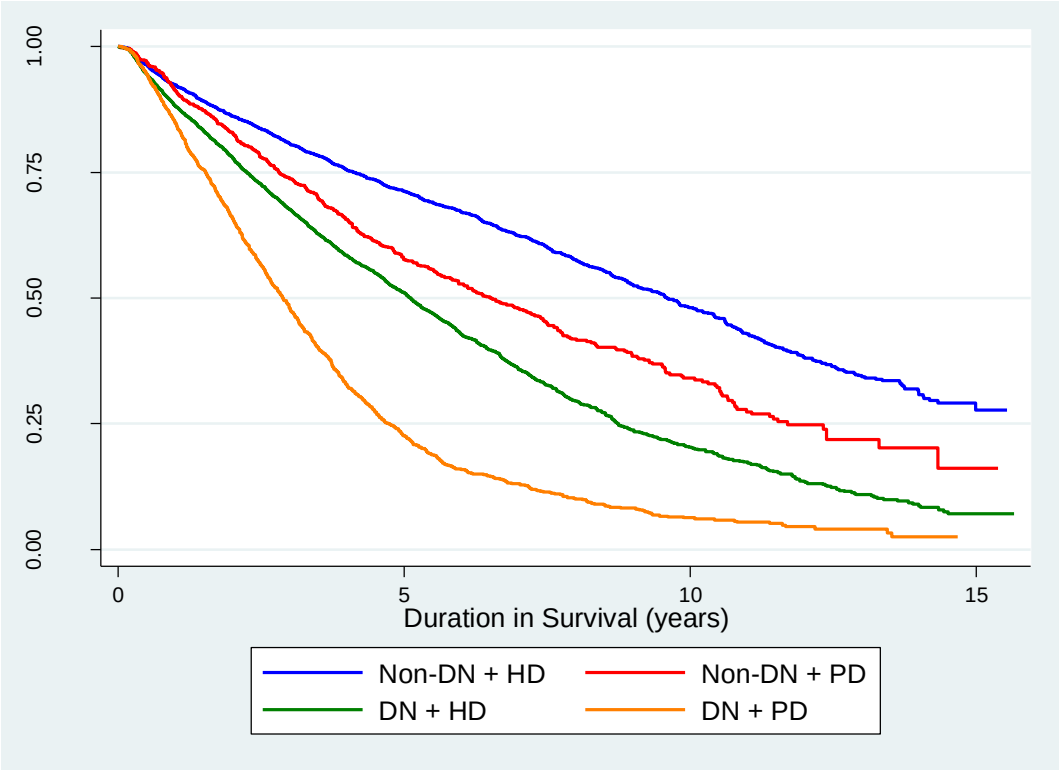
1999 – 2013	Age < 60			Age ≥ 60		
	PD	HD	HD + PD	PD	HD	HD + PD
1 year survival in % (95% C.I.)	91.2 (89.4 – 92.7)	93.1 (92.3 – 93.8)	92.7 (92.0 – 93.4)	84.2 (82.1 – 86.0)	86.7 (85.6 – 87.7)	86.0 (85.1 – 86.9)
5 years survival in % (95% C.I.)	52.5 (49.2 – 55.7)	71.1 (69.5 – 72.6)	66.9 (65.5 – 68.4)	22.3 (19.8 – 24.8)	47.7 (45.9 – 49.5)	40.7 (39.2 – 42.2)
Median Survival (Years)	5.2	9.1	8.3	2.8	4.6	3.9

Similarly, non-diabetic patients have better survival as compared to diabetics (p<0.001). There was a 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 – 2013

1999–2013	DN		Non-DN		DN	Non-DN
	PD	HD	PD	HD	HD+PD	HD+PD
1 year survival in % (95% C.I.)	84.9 (83.0 – 86.6)	88.2 (87.2 – 89.1)	91.3 (89.3 – 93.0)	92.4 (91.4 – 93.2)	87.4 (86.5 – 88.2)	92.1 (91.3 – 92.9)
5 years survival in % (95% C.I.)	22.7 (20.3 – 25.1)	51.1 (49.4 – 52.8)	57.7 (54.1 – 61.1)	71.2 (69.5 – 72.9)	43.5 (42.1 – 45.0)	68.2 (66.6 – 70.0)
Median Survival (Years)	2.9	5.1	6.5	9.6	4.2	8.9

Figure 8.9.3.2: SURVIVAL BY DIABETES STATUS (PRIMARY CAUSE) AND MODALITY, 1999 – 2013



9 THE TRANSPLANT POPULATION

9.1 Incidence and Prevalence

In 2012, 51 (CR 13.4 pmp) renal transplants were performed in Singapore. In addition, 11 patients received transplants overseas in 2012, bringing the total of newly transplanted patients to 62 in 2012. In 2013, 69 (CR 17.9 pmp) renal transplants were performed in Singapore. In addition, 15 patients received transplants overseas, bringing the total of newly transplanted patients to 84 in 2013. See Table 9.1.1.

There were 30 deaths in 2012. In addition, there were 32 (CR 8.4 pmp) transplant patients who returned to dialysis in 2012. After taking into account the deaths of patients and graft losses, there were 1,407 (CR 368.5 pmp; ASR 261.8 pmp) prevalent renal transplant patients at the end of 2012.

There were 39 deaths in 2013. In addition, there were 18 (CR 4.7 pmp) transplant patients who returned to dialysis in 2013. After taking into account the deaths of patients and graft losses, there were 1,434 (CR 373.0 pmp; ASR 261.0 pmp) prevalent renal transplant patients at the end of 2013.

In comparison to international statistics*, the prevalent rates of functioning grafts in Singapore in 2012 (368/pmp) was higher than that of New Zealand (344/pmp) and Korea (272/pmp), but lower than Australia (411/pmp), Denmark (411/pmp), Hong Kong (484/pmp), Norway (639/pmp), Sweden (530/pmp) and USA (594/pmp).

* The paragraph above is with reference to: United States Renal Data System (USRDS), 2014 Annual Data Report. All rates were unadjusted.

Table 9.1.1: INCIDENT AND PREVALENT TRANSPLANT PATIENTS

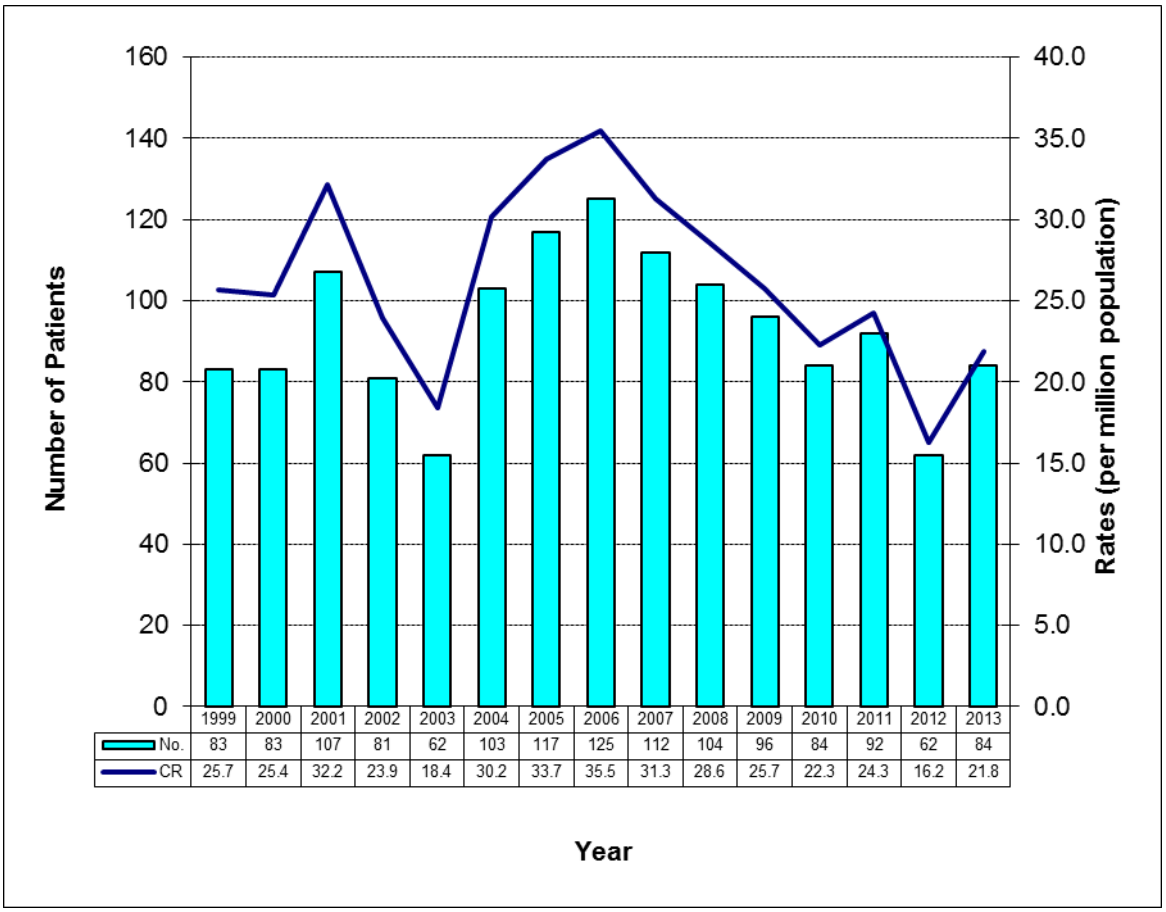
	2012					
	Incident Population		Outcome Post Transplant			Prevalent Population
	Transplanted in Singapore	Transplanted Overseas	Death with Functioning Graft	Death and Graft Failure	Return to Dialysis	Year End Prevalence
Number	51	11	30	0	32	1407
CR*	13.4	2.9	7.9	0.0	8.4	368.5
ASR*	-	-	-	-	-	261.8

	2013					
	Incident Population		Outcome Post Transplant			Prevalent Population
	Transplanted in Singapore	Transplanted Overseas	Death with Functioning Graft	Death and Graft Failure	Return to Dialysis	Year End Prevalence
Number	69	15	37	2	18	1434
CR*	17.9	3.9	9.6	0.5	4.7	373.0
ASR*	-	-	-	-	-	261.0

* per million resident population.

The number of incident transplant patients was at its lowest in 2012 followed by 2003 over the period of analysis between 1999 and 2013. The low transplant rate in 2003 was likely due to the severe acute respiratory syndrome (SARS) epidemic in Singapore that prevented delivery of some elective medical services. Generally, the CR for incident transplant patients ranged from 22.3 pmp to 35.5 pmp in 1999-2013, except for the low rate of 18.4 pmp in 2003 and 16.2 in 2012. See Figure 9.1.1.

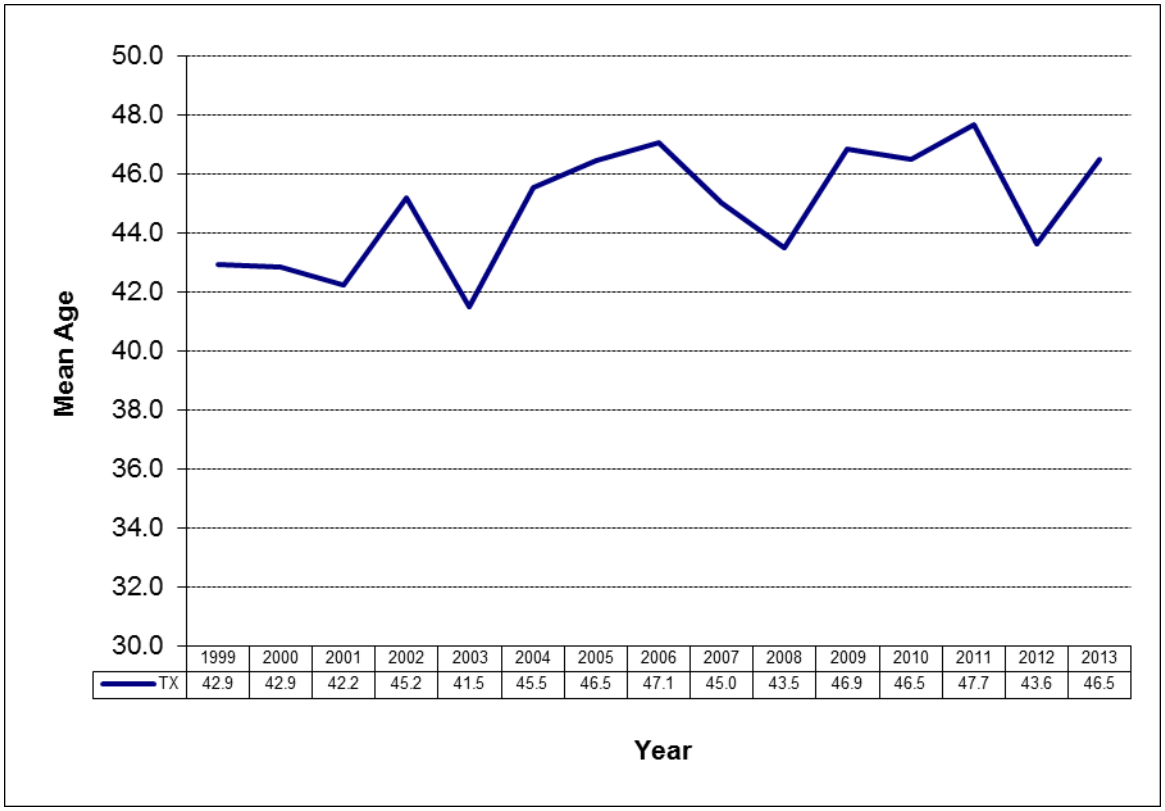
Figure 9.1.1: CRUDE RATE AND TOTAL NUMBER OF INCIDENT TRANSPLANT PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No.	83	83	107	81	62	103	117	125	112	104	96	84	92	62	84
CR	25.7	25.4	32.2	23.9	18.4	30.2	33.7	35.5	31.3	28.6	25.7	22.3	24.3	16.2	21.8

A slight increase in the mean age of incident transplant patients was observed from 42.9 years in 1999 to 46.5 years in 2013. See Figure 9.1.2.

Figure 9.1.2: AGE OF INCIDENT TRANSPLANT PATIENTS, 1999 – 2013



9.1.1 Incident Transplant Patients by Age Group and Gender

In 2012, 50.0% of incident transplant patients were males. This was 58.3% in 2013. Among all incident patients who received transplants in 2012 and 2013, the majority were aged between 30 and 59 years. See Table 9.1.1.1. The increasing age of incident transplant patients in the period 1999 – 2013 is also evident in Figure 9.1.1.1. Notably, in 2006 and 2013, more than 50% of incident transplant patients were older than 40 years old.

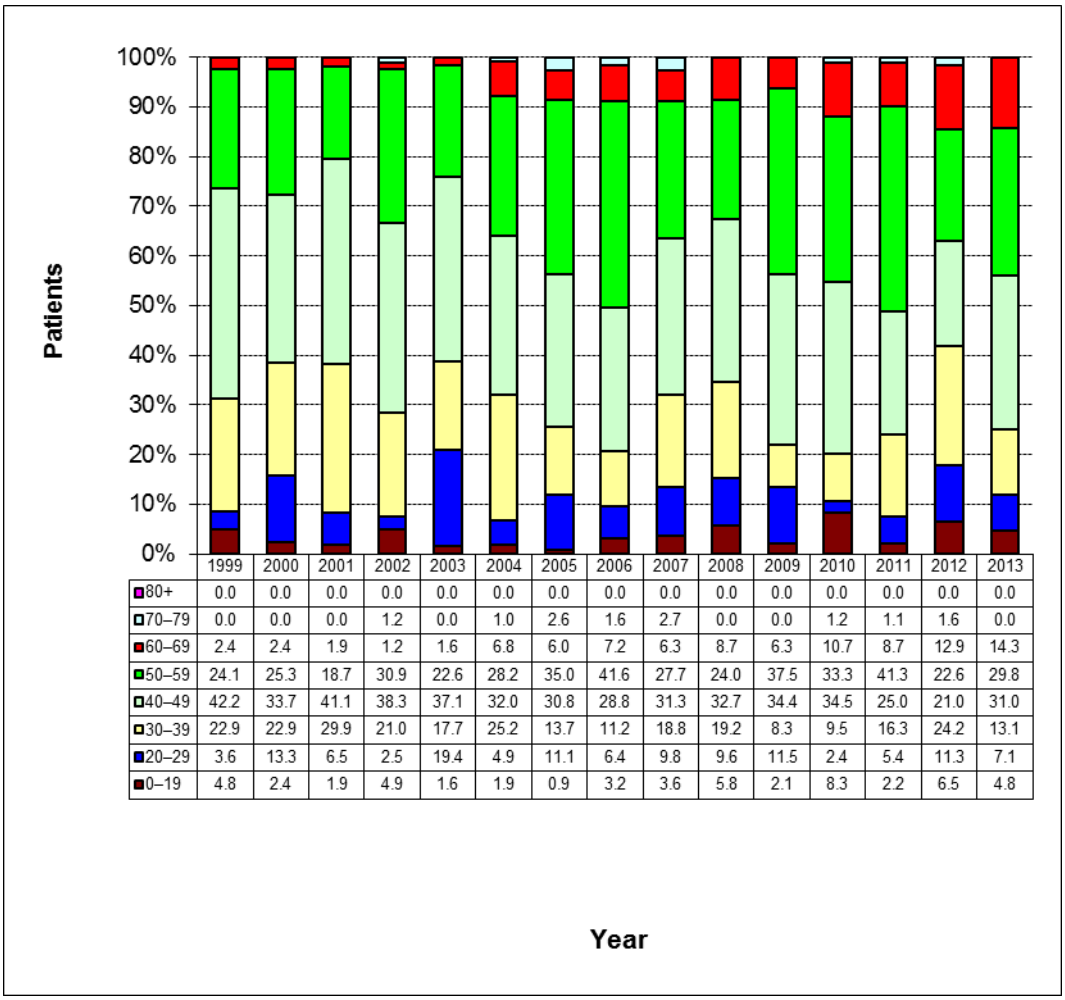
Table 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	2	6.5	2	6.5	4	6.5
20–29	3	9.7	4	12.9	7	11.3
30–39	6	19.4	9	29.0	15	24.2
40–49	7	22.6	6	19.4	13	21.0
50–59	7	22.6	7	22.6	14	22.6
60–69	5	16.1	3	9.7	8	12.9
70–79	1	3.2	0	0.0	1	1.6
80 +	0	0.0	0	0.0	0	0.0
All Age Groups	**31**	**100**	**31**	**100**	**62**	**100**

Table 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	3	6.1	1	2.9	4	4.8
20–29	3	6.1	3	8.6	6	7.1
30–39	6	12.2	5	14.3	11	13.1
40–49	15	30.6	11	31.4	26	31.0
50–59	15	30.6	10	28.6	25	29.8
60–69	7	14.3	5	14.3	12	14.3
70–79	0	0.0	0	0.0	0	0.0
80 +	0	0.0	0	0.0	0	0.0
All Age Groups	**49**	**100**	**35**	**100**	**84**	**100**

Figure 9.1.1.1: INCIDENT TRANSPLANT PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70–79	0.0	0.0	0.0	1.2	0.0	1.0	2.6	1.6	2.7	0.0	0.0	1.2	1.1	1.6	0.0
60–69	2.4	2.4	1.9	1.2	1.6	6.8	6.0	7.2	6.3	8.7	6.3	10.7	8.7	12.9	14.3
50–59	24.1	25.3	18.7	30.9	22.6	28.2	35.0	41.6	27.7	24.0	37.5	33.3	41.3	22.6	29.8
40–49	42.2	33.7	41.1	38.3	37.1	32.0	30.8	28.8	31.3	32.7	34.4	34.5	25.0	21.0	31.0
30–39	22.9	22.9	29.9	21.0	17.7	25.2	13.7	11.2	18.8	19.2	8.3	9.5	16.3	24.2	13.1
20–29	3.6	13.3	6.5	2.5	19.4	4.9	11.1	6.4	9.8	9.6	11.5	2.4	5.4	11.3	7.1
0–19	4.8	2.4	1.9	4.9	1.6	1.9	0.9	3.2	3.6	5.8	2.1	8.3	2.2	6.5	4.8

9.1.2 Incident Transplant Patients by Ethnic Group and Gender

In 2012, 74.2% of incident transplant patients were Chinese. This was 73.8% in 2013. The percentage of Malay incident transplant was 9.7% in 2012 and 16.7% in 2013. See Table 9.1.2.1.

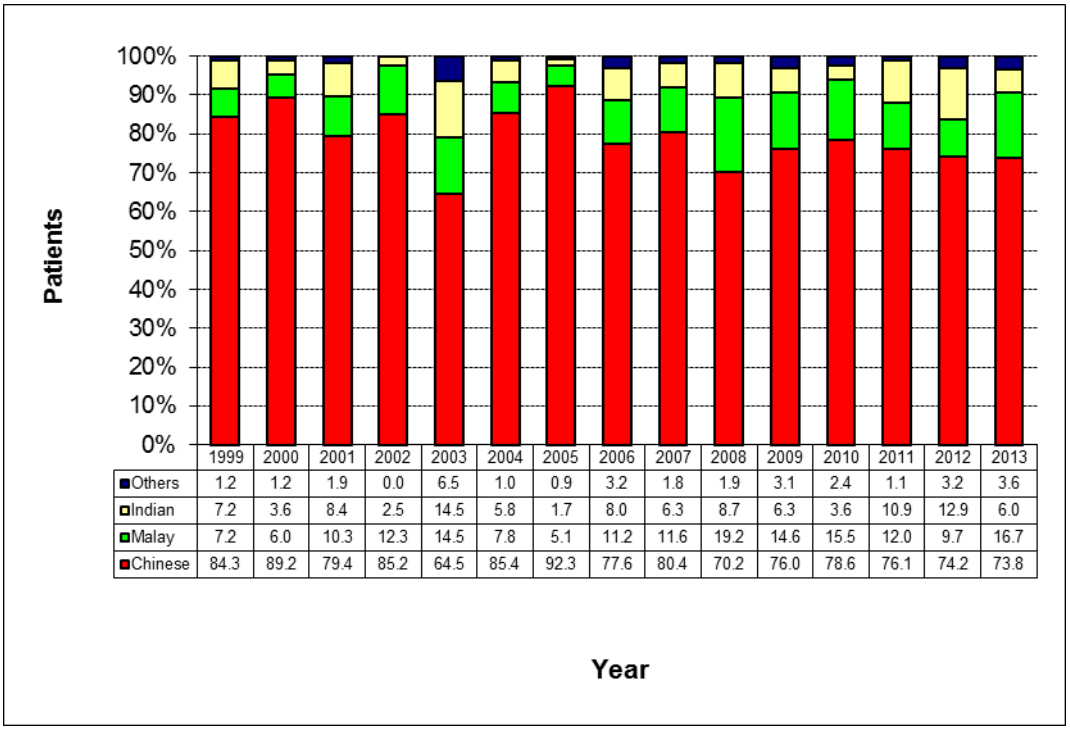
Table 9.1.2.1: INCIDENT TRANSPLANT PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	27	87.1	19	61.3	46	74.2
Malay	2	6.5	4	12.9	6	9.7
Indian	1	3.2	7	22.6	8	12.9
Others	1	3.2	1	3.2	2	3.2
All Ethnic Groups	**31**	**100**	**31**	**100**	**62**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	37	75.5	25	71.4	62	73.8
Malay	8	16.3	6	17.1	14	16.7
Indian	1	2.0	4	11.4	5	6.0
Others	3	6.1	0	0.0	3	3.6
All Ethnic Groups	**49**	**100**	**35**	**100**	**84**	**100**

Likewise, in the period 1999 – 2013, 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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	1.2	1.2	1.9	0.0	6.5	1.0	0.9	3.2	1.8	1.9	3.1	2.4	1.1	3.2	3.6
Indian	7.2	3.6	8.4	2.5	14.5	5.8	1.7	8.0	6.3	8.7	6.3	3.6	10.9	12.9	6.0
Malay	7.2	6.0	10.3	12.3	14.5	7.8	5.1	11.2	11.6	19.2	14.6	15.5	12.0	9.7	16.7
Chinese	84.3	89.2	79.4	85.2	64.5	85.4	92.3	77.6	80.4	70.2	76.0	78.6	76.1	74.2	73.8

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

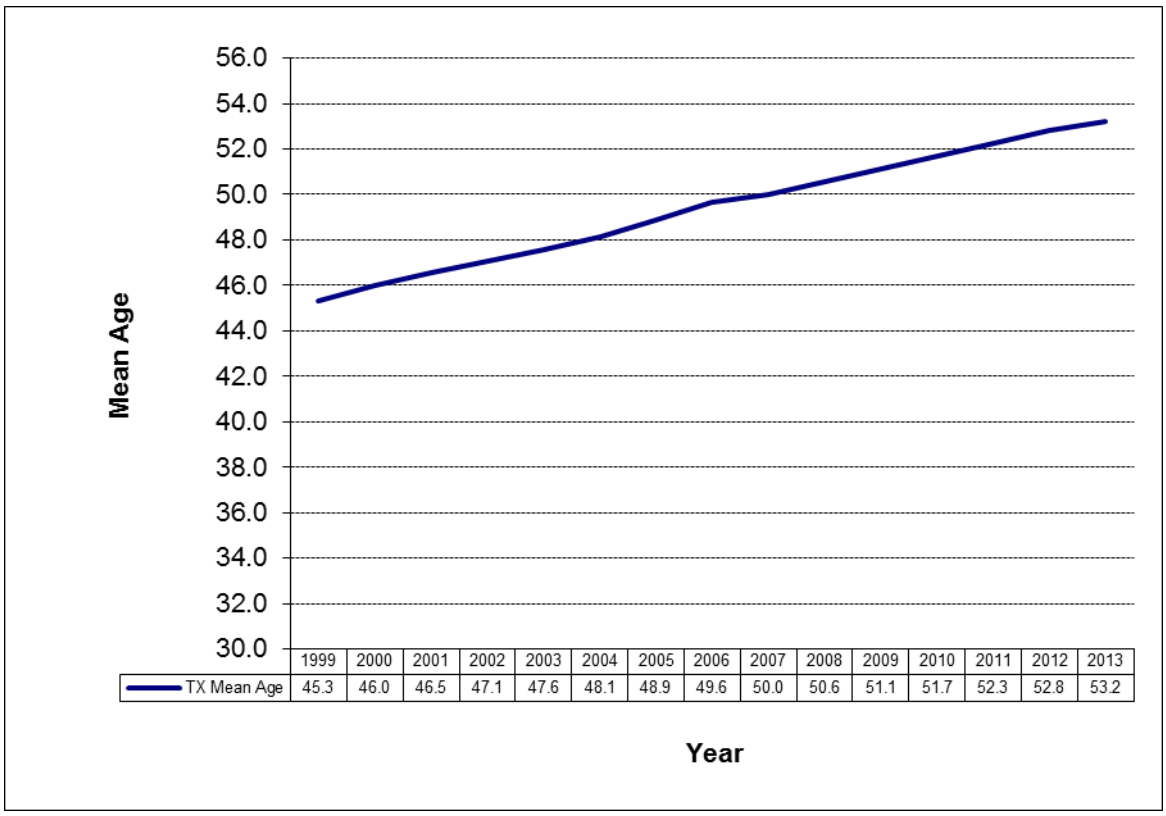
Table 9.1.2.2: INCIDENT TRANSPLANT PATIENTS BY GENDER, 1999 – 2013

YEAR	Male		Female		Both Genders	
	No	%	No	%	No	%
1999	44	53.0	39	47.0	83	100.0
2000	43	51.8	40	48.2	83	100.0
2001	71	66.4	36	33.6	107	100.0
2002	39	48.1	42	51.9	81	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	66	52.8	59	47.2	125	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	57.6	39	42.4	92	100.0
2012	31	50.0	31	50.0	62	100.0
2013	49	58.3	35	41.7	84	100.0

9.1.3 Prevalent Transplant Patients by Age Group and Gender

Among prevalent patients, their mean age was 52.8 years in 2012 and 53.2 years in 2013. Expectedly, the mean age for prevalent transplant patients increased from 45.3 years in 1999 to 53.2 years in 2013. See Figure 9.1.3.1.

Figure 9.1.3.1: AGE OF PREVALENT TRANSPLANT PATIENTS, 1999 – 2013



53.1% and 52.9% of the prevalent patients were males in 2012 and 2013 respectively. The age distribution of prevalent transplant patients is shown in Tables 9.1.3.1, where the greatest proportion was in the age group 50-59 years.

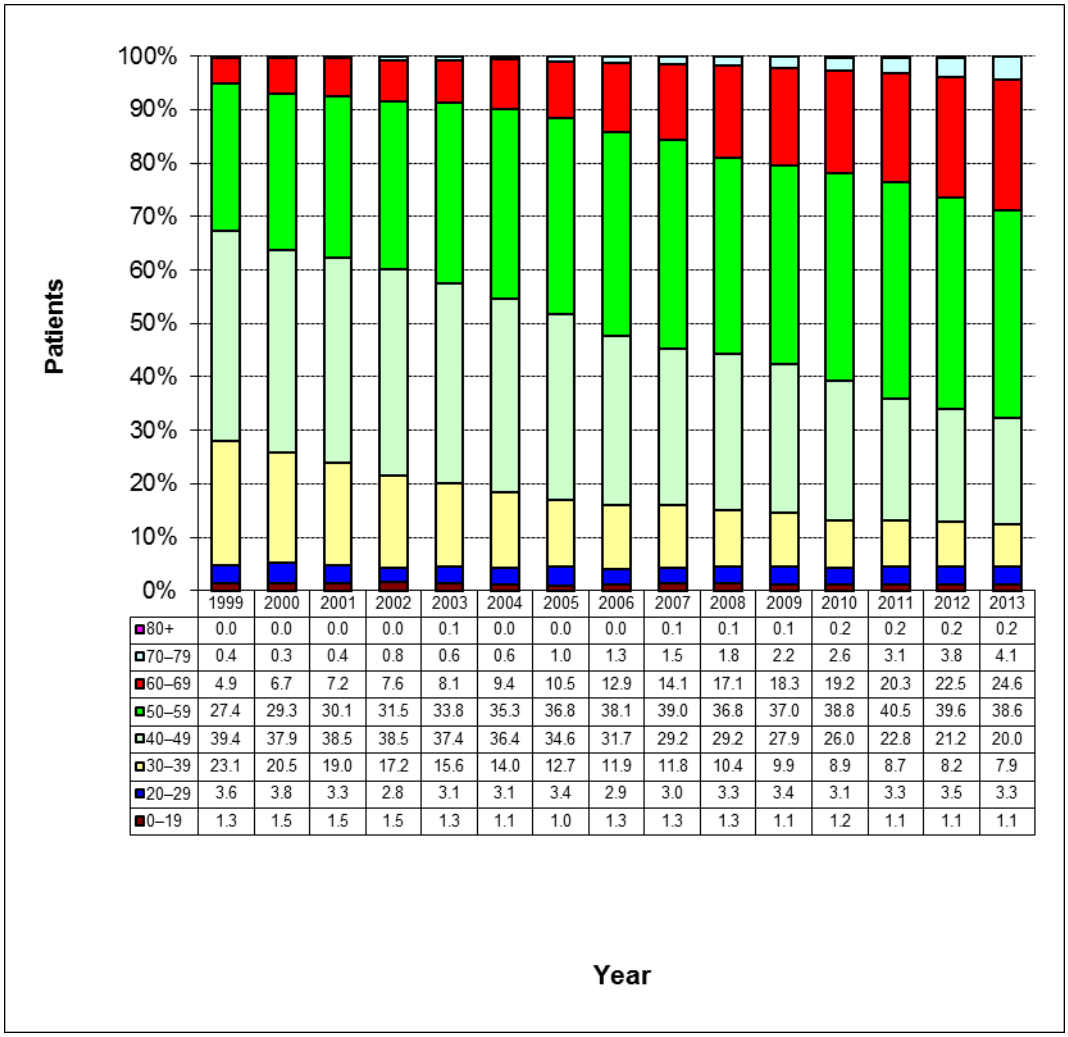
Table 9.1.3.1: PREVALENT TRANSPLANT PATIENTS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	9	1.2	6	0.9	15	1.1
20–29	18	2.4	31	4.7	49	3.5
30–39	60	8.0	56	8.5	116	8.2
40–49	150	20.1	148	22.4	298	21.2
50–59	285	38.2	272	41.2	557	39.6
60–69	187	25.0	129	19.5	316	22.5
70–79	37	5.0	16	2.4	53	3.8
80 +	1	0.1	2	0.3	3	0.2
All Age Groups	**747**	**100**	**660**	**100**	**1407**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	9	1.2	7	1.0	16	1.1
20–29	21	2.8	27	4.0	48	3.3
30–39	52	6.9	62	9.2	114	7.9
40–49	145	19.1	142	21.0	287	20.0
50–59	283	37.3	271	40.1	554	38.6
60–69	205	27.0	148	21.9	353	24.6
70–79	42	5.5	17	2.5	59	4.1
80 +	2	0.3	1	0.1	3	0.2
All Age Groups	**759**	**100**	**675**	**100**	**1434**	**100**

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

Figure 9.1.3.2: PREVALENT TRANSPLANT PATIENTS BY AGE GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
80+	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2
70–79	0.4	0.3	0.4	0.8	0.6	0.6	1.0	1.3	1.5	1.8	2.2	2.6	3.1	3.8	4.1
60–69	4.9	6.7	7.2	7.6	8.1	9.4	10.5	12.9	14.1	17.1	18.3	19.2	20.3	22.5	24.6
50–59	27.4	29.3	30.1	31.5	33.8	35.3	36.8	38.1	39.0	36.8	37.0	38.8	40.5	39.6	38.6
40–49	39.4	37.9	38.5	38.5	37.4	36.4	34.6	31.7	29.2	29.2	27.9	26.0	22.8	21.2	20.0
30–39	23.1	20.5	19.0	17.2	15.6	14.0	12.7	11.9	11.8	10.4	9.9	8.9	8.7	8.2	7.9
20–29	3.6	3.8	3.3	2.8	3.1	3.1	3.4	2.9	3.0	3.3	3.4	3.1	3.3	3.5	3.3
0–19	1.3	1.5	1.5	1.5	1.3	1.1	1.0	1.3	1.3	1.3	1.1	1.2	1.1	1.1	1.1

9.1.4 Prevalent Transplant Patients by Ethnic Group and Gender

Among prevalent transplant patients in 2012 and 2013, the majority were Chinese. See Table 9.1.4.1.

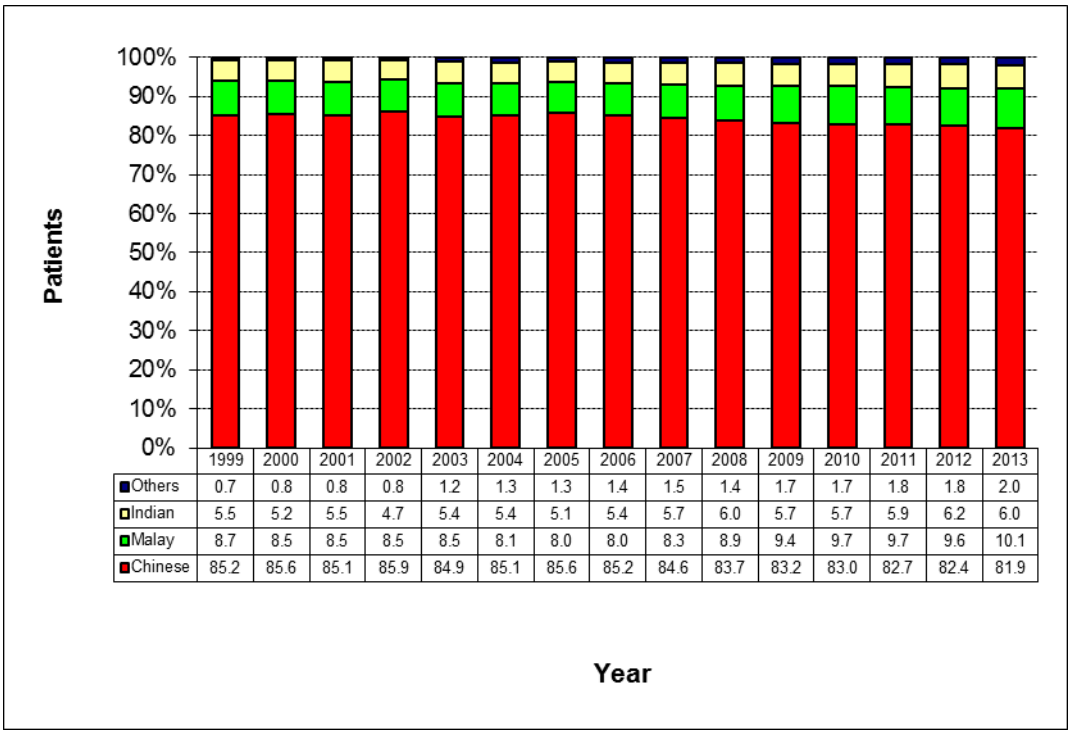
Table 9.1.4.1: PREVALENT TRANSPLANT PATIENTS BY ETHNIC GROUP AND GENDER

2012 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	620	83.0	539	81.7	1159	82.4
Malay	64	8.6	71	10.8	135	9.6
Indian	49	6.6	38	5.8	87	6.2
Others	14	1.9	12	1.8	26	1.8
All Ethnic Groups	**747**	**100**	**660**	**100**	**1407**	**100**

2013 ETHNIC GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	627	82.6	548	81.2	1175	81.9
Malay	70	9.2	75	11.1	145	10.1
Indian	46	6.1	40	5.9	86	6.0
Others	16	2.1	12	1.8	28	2.0
All Ethnic Groups	**759**	**100**	**675**	**100**	**1434**	**100**

Throughout the period 1999 – 2013, Chinese comprised the highest proportion of prevalent transplant patients and were above 80%.

Figure 9.1.4.1: PREVALENT TRANSPLANT PATIENTS BY ETHNIC GROUP, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Others	0.7	0.8	0.8	0.8	1.2	1.3	1.3	1.4	1.5	1.4	1.7	1.7	1.8	1.8	2.0
Indian	5.5	5.2	5.5	4.7	5.4	5.4	5.1	5.4	5.7	6.0	5.7	5.7	5.9	6.2	6.0
Malay	8.7	8.5	8.5	8.5	8.5	8.1	8.0	8.0	8.3	8.9	9.4	9.7	9.7	9.6	10.1
Chinese	85.2	85.6	85.1	85.9	84.9	85.1	85.6	85.2	84.6	83.7	83.2	83.0	82.7	82.4	81.9

The ratio of males to females among the prevalent transplant patients from 1999 to 2013 was about 1:1. See Table 9.1.4.2.

Table 9.1.4.2: PREVALENT TRANSPLANT PATIENTS BY GENDER, 1999 – 2013

YEAR	Male		Female	
	No	%	No	%
1999	450	53.4	393	46.6
2000	479	54.0	408	46.0
2001	530	55.2	431	44.8
2002	532	54.6	442	45.4
2003	553	55.3	447	44.7
2004	577	55.0	472	45.0
2005	613	55.0	501	45.0
2006	650	54.9	534	45.1
2007	671	54.3	564	45.7
2008	701	54.8	579	45.2
2009	722	54.4	606	45.6
2010	738	54.0	629	46.0
2011	752	53.4	655	46.6
2012	747	53.1	660	46.9
2013	759	52.9	675	47.1

9.2 Aetiology of Renal Failure among Renal Transplants

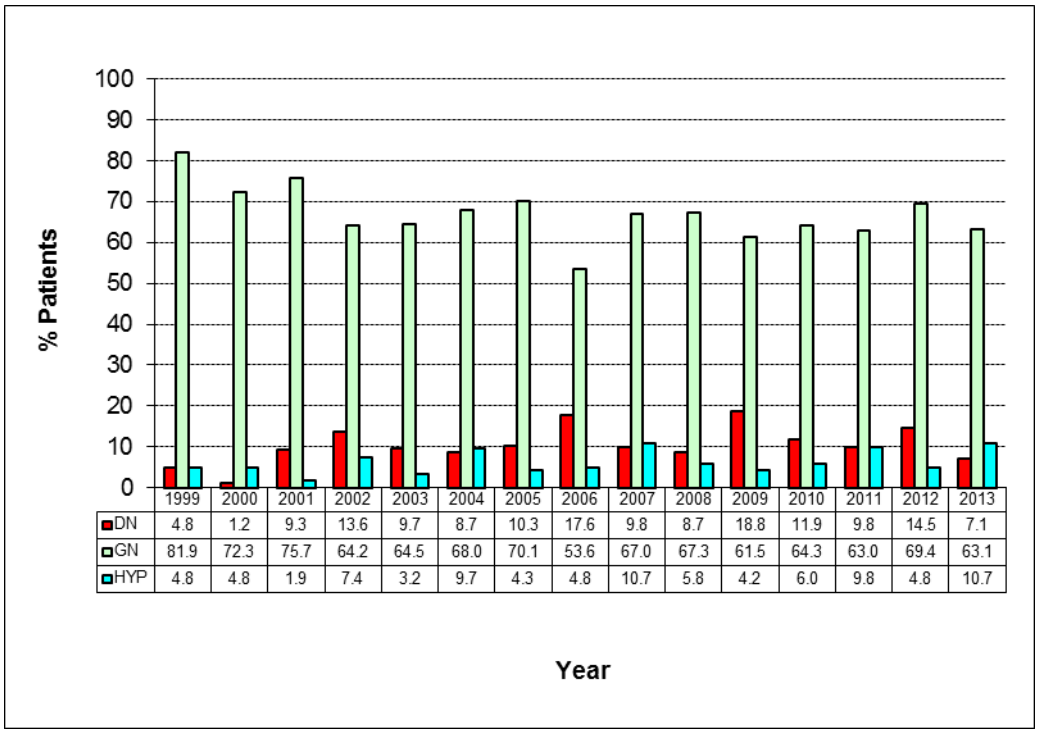
Most incident renal transplant patients had GN (69.4% in 2012, 63.1% in 2013) as the underlying aetiology of renal failure. Patients with underlying DN among incident transplants were 14.5% in 2012 and 7.1% in 2013. The corresponding figure for hypertension and renovascular disease as a group was 4.8% in 2012 and 10.7% in 2013. See Table 9.2.1.

Likewise, of the prevalent transplant population, the majority (70.7% in 2012, 70.5% in 2013) had primary GN as the aetiology of renal failure while patients with DN comprised only 7.7% in 2012 and 2013. The corresponding figure for hypertension and renovascular disease as a group was 6.0% in 2012 and 6.1% in 2013. See Table 9.2.1. This was in sharp contrast to the dialysis population where the vast majority of patients had underlying DN as the aetiology of renal failure. See Tables 9.2.1.1 and 9.2.2.1. Among incident transplant patients, the proportion of DN as aetiology of renal failure increased from 4.8% in 1999 to 7.1% in 2013. Similarly, an increasing proportion of DN 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

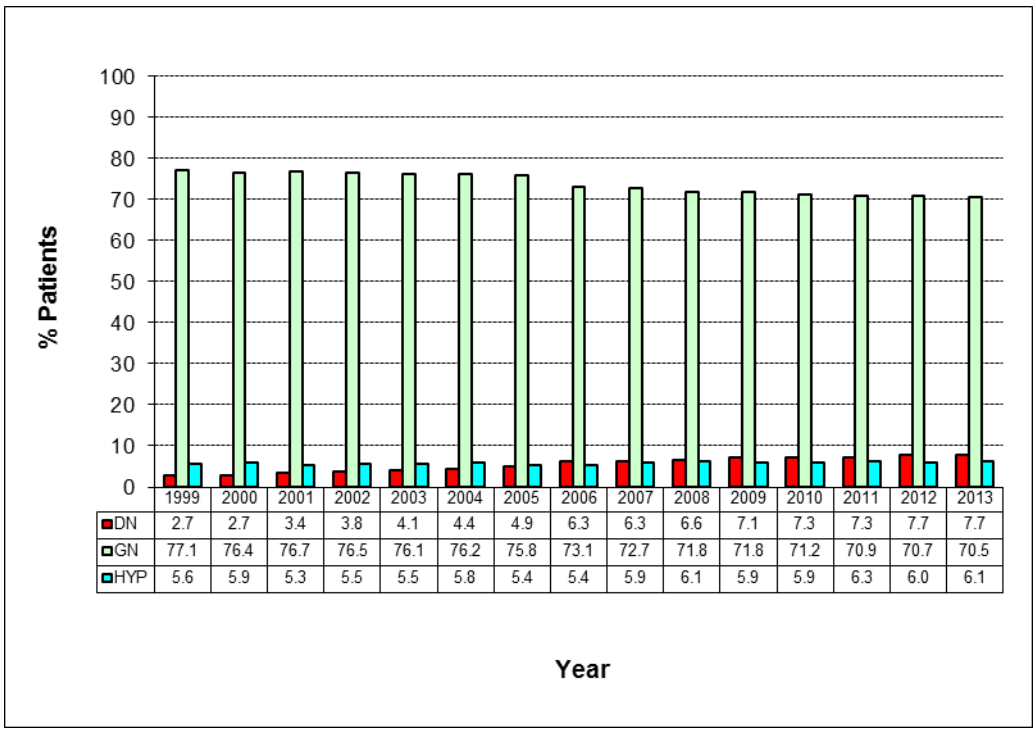
AETIOLOGY OF RENAL FAILURE	2012				2013			
	Incident		Prevalent		Incident		Prevalent	
	No	%	No	%	No	%	No	%
Diabetic Nephropathy	9	14.5	109	7.7	6	7.1	110	7.7
Primary Glomerulonephritis (GN)	43	69.4	995	70.7	53	63.1	1011	70.5
Autoimmune Disease/GN with Systemic Manifestations	1	1.6	61	4.3	5	6.0	64	4.5
Hypertension and Renovascular Disease	3	4.8	85	6.0	9	10.7	88	6.1
Polycystic Kidney Disease / Other Cystic Diseases	2	3.2	55	3.9	4	4.8	56	3.9
Vesicoureteric Reflex / Chronic Pyelonephritis	0	0.0	22	1.6	0	0.0	22	1.5
Obstruction	0	0.0	4	0.3	0	0.0	4	0.3
Stone Disease	0	0.0	3	0.2	0	0.0	2	0.1
Miscellaneous	3	4.8	40	2.8	4	4.8	42	2.9
Unknown	1	1.6	33	2.3	3	3.6	35	2.4
All Aetiology	**62**	**100**	**1407**	**100**	**84**	**100**	**1434**	**100**

Figure 9.2.1: DIABETIC NEPHROPATHY, GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE AS AETIOLOGY OF RENAL FAILURE AMONG INCIDENT TRANSPLANT PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DN	4.8	1.2	9.3	13.6	9.7	8.7	10.3	17.6	9.8	8.7	18.8	11.9	9.8	14.5	7.1
GN	81.9	72.3	75.7	64.2	64.5	68.0	70.1	53.6	67.0	67.3	61.5	64.3	63.0	69.4	63.1
HYP	4.8	4.8	1.9	7.4	3.2	9.7	4.3	4.8	10.7	5.8	4.2	6.0	9.8	4.8	10.7

Figure 9.2.2: DIABETIC NEPHROPATHY, GLOMERULONEPHRITIS AND HYPERTENSION/RENOVASCULAR DISEASE AS AETIOLOGY OF RENAL FAILURE AMONG PREVALENT TRANSPLANT PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DN	2.7	2.7	3.4	3.8	4.1	4.4	4.9	6.3	6.3	6.6	7.1	7.3	7.3	7.7	7.7
GN	77.1	76.4	76.7	76.5	76.1	76.2	75.8	73.1	72.7	71.8	71.8	71.2	70.9	70.7	70.5
HYP	5.6	5.9	5.3	5.5	5.5	5.8	5.4	5.4	5.9	6.1	5.9	5.9	6.3	6.0	6.1

9.3 Co-morbid Conditions

DM was reported in 24.2% of newly transplanted patients in 2012 and 19.0% in 2013. See Table 9.3.1 and Figure 9.3.1.

IHD was reported in 16.1% of patients in 2012 and 16.7% in 2013. This was 1.6% in 2012 and 4.8% in 2013for CVD. For PVD, this was 1.6% in 2012 and 0.0% in 2013.

8.1% of the patients were current smokers in 2012 and 7.1% in 2013. Former smokers constituted 17.7% in 2012 and 21.4% in 2013.

In 2012, 3.2% of incident transplant patients were serologically positive for HBsAg while this was 6.0% in 2013. There was no patient who was Anti-HCV positive in 2012 and there were only 3.6% of incident transplant patients who were Anti-HCV positive. A small proportion of patients had unknown HBsAg and Anti-HCV status.

An increase in the proportion of incident patients with co-morbidities was observed over the period from 1999 to 2013. See Figure 9.3.1.

Table 9.3.1: CO-MORBID CONDITIONS AMONG INCIDENT TRANSPLANT PATIENTS

Diabetes Mellitus	2012		2013	
	No	%	No	%
Yes	15	24.2	16	19.0
No	47	75.8	68	81.0
Unknown	0	0.0	0	0.0
Total	**62**	**100**	**84**	**100**

Ischaemic Heart Disease	2012		2013	
	No	%	No	%
Yes	10	16.1	14	16.7
No	52	83.9	70	83.3
Unknown	0	0.0	0	0.0
Total	**62**	**100**	**84**	**100**

Cerebrovascular Disease	2012		2013	
	No	%	No	%
Yes	1	1.6	4	4.8
No	61	98.4	80	95.2
Unknown	0	0.0	0	0.0
Total	**62**	**100**	**84**	**100**

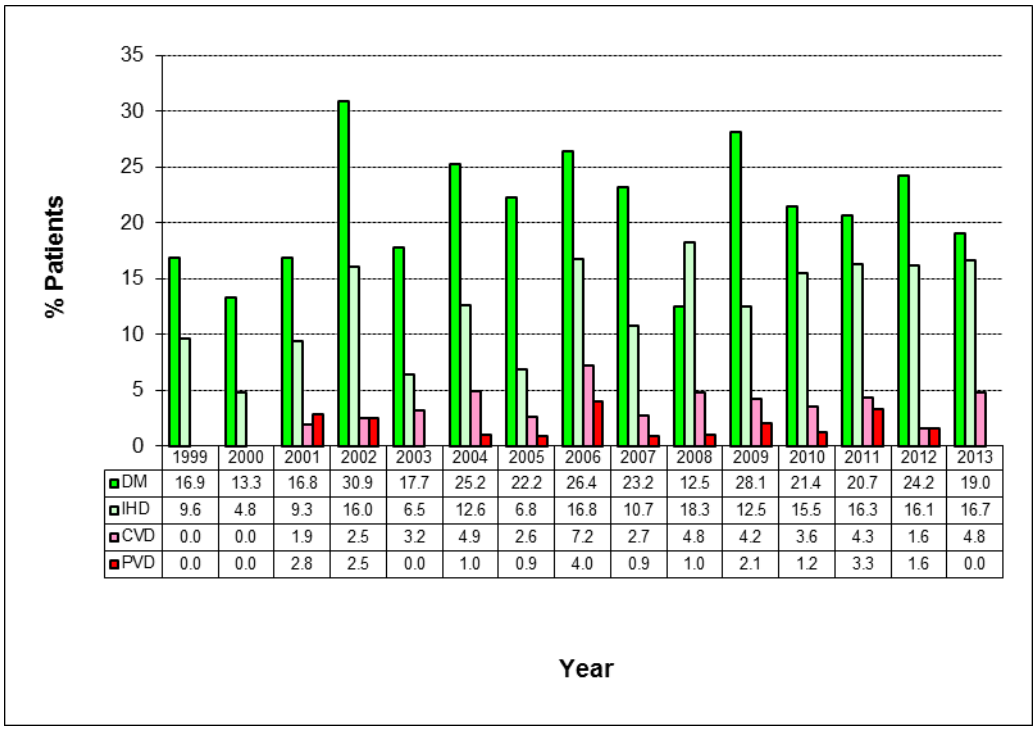
Peripheral Vascular Disease	2012		2013	
	No	%	No	%
Yes	1	1.6	0	0.0
No	61	98.4	84	100.0
Unknown	0	0.0	0	0.0
Total	**62**	**100**	**84**	**100**

Smoking	2012		2013	
	No	%	No	%
Current Smoker	5	8.1	6	7.1
Ex-Smoker	11	17.7	18	21.4
Non-Smoker	44	71.0	58	69.0
Unknown	2	3.2	2	2.4
Total	**62**	**100**	**84**	**100**

Hepatitis B S Ag Status	2012		2013	
	No	%	No	%
Positive	2	3.2	5	6.0
Negative	55	88.7	78	92.9
Unknown	5	8.1	1	1.2
Total	**62**	**100**	**84**	**100**

Anti-HCV Status	2012		2013	
	No	%	No	%
Positive	0	0.0	3	3.6
Negative	58	93.5	80	95.2
Unknown	4	6.5	1	1.2
Total	**62**	**100**	**84**	**100**

Figure 9.3.1: CO-MORBID CONDITIONS AMONG INCIDENT TRANSPLANT PATIENTS, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DM	16.9	13.3	16.8	30.9	17.7	25.2	22.2	26.4	23.2	12.5	28.1	21.4	20.7	24.2	19.0
IHD	9.6	4.8	9.3	16.0	6.5	12.6	6.8	16.8	10.7	18.3	12.5	15.5	16.3	16.1	16.7
CVD	0.0	0.0	1.9	2.5	3.2	4.9	2.6	7.2	2.7	4.8	4.2	3.6	4.3	1.6	4.8
PVD	0.0	0.0	2.8	2.5	0.0	1.0	0.9	4.0	0.9	1.0	2.1	1.2	3.3	1.6	0.0

The list of co-morbidities affecting prevalent transplant patients is shown in Table 9.3.2. About one quarter (26.8% in 2012, 26.0% in 2013) had DM. The higher incidence of DM in prevalent transplant patients may be related to post-transplant immunosuppressive therapy as only a small proportion had underlying DN. Other co-morbidities/risk factors included IHD, CVD, PVD, current smokers, positive HBsAg and Anti-HCV. 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 those who were prevalent dialysis patients. See Table 9.3.2 and Table 8.5.1.1 for comparison.

Table 9.3.2: CO-MORBID CONDITIONS AMONG PREVALENT TRANSPLANT PATIENTS

Diabetes Mellitus	2012		2013	
	No	%	No	%
Yes	377	26.8	373	26.0
No	1030	73.2	1061	74.0
Unknown	0	0.0	0	0.0
Total	**1407**	**100**	**1434**	**100**

Ischaemic Heart Disease	2012		2013	
	No	%	No	%
Yes	227	16.1	225	15.7
No	1180	83.9	1209	84.3
Unknown	0	0.0	0	0.0
Total	**1407**	**100**	**1434**	**100**

Cerebrovascular Disease	2012		2013	
	No	%	No	%
Yes	68	4.8	74	5.2
No	1339	95.2	1360	94.8
Unknown	0	0.0	0	0.0
Total	**1407**	**100**	**1434**	**100**

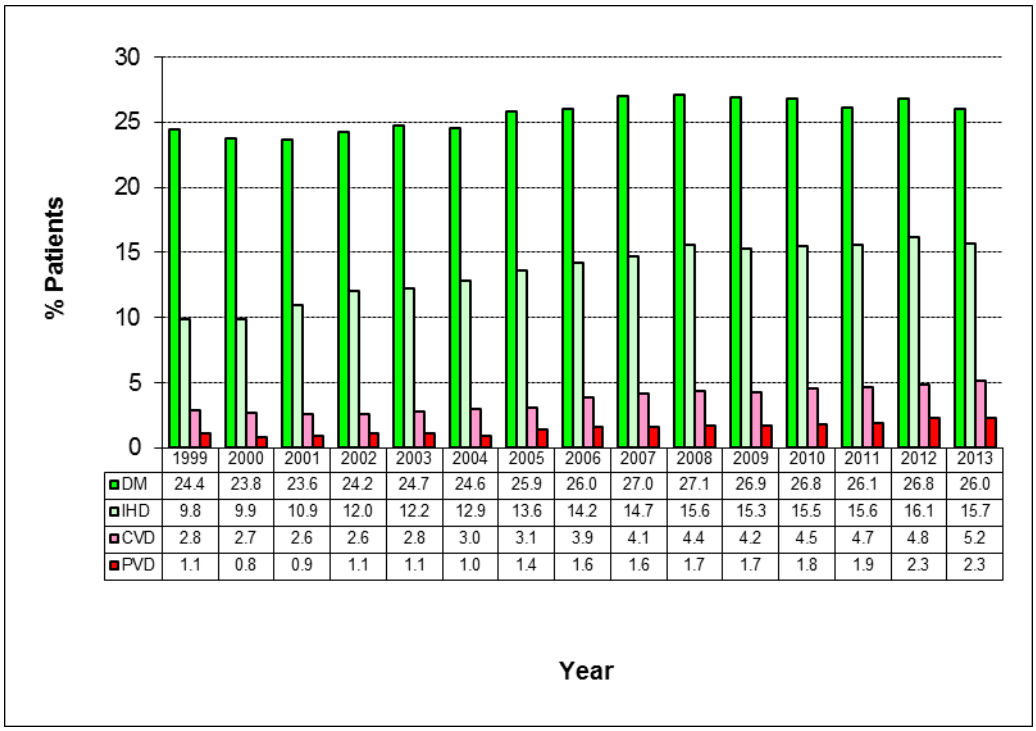
Peripheral Vascular Disease	2012		2013	
	No	%	No	%
Yes	32	2.3	33	2.3
No	1375	97.7	1401	97.7
Unknown	0	0.0	0	0.0
Total	**1407**	**100**	**1434**	**100**

Smoking	2012		2013	
	No	%	No	%
Current Smoker	53	3.8	56	3.9
Ex-Smoker	198	14.1	209	14.6
Non-Smoker	1133	80.5	1144	79.8
Unknown	23	1.6	25	1.7
Total	**1407**	**100**	**1434**	**100**

Hepatitis B S Ag Status	2012		2013	
	No	%	No	%
Positive	46	3.3	50	3.5
Negative	1345	95.6	1371	95.6
Unknown	16	1.1	13	0.9
Total	**1407**	**100**	**1434**	**100**

Anti-HCV Status	2012		2013	
	No	%	No	%
Positive	57	4.1	52	3.6
Negative	1320	93.8	1357	94.6
Unknown	30	2.1	25	1.7
Total	**1407**	**100**	**1434**	**100**

Figure 9.3.2: CO-MORBID CONDITIONS AMONG PREVALENT TRANSPLANT PATIENTS, 1999 – 2013



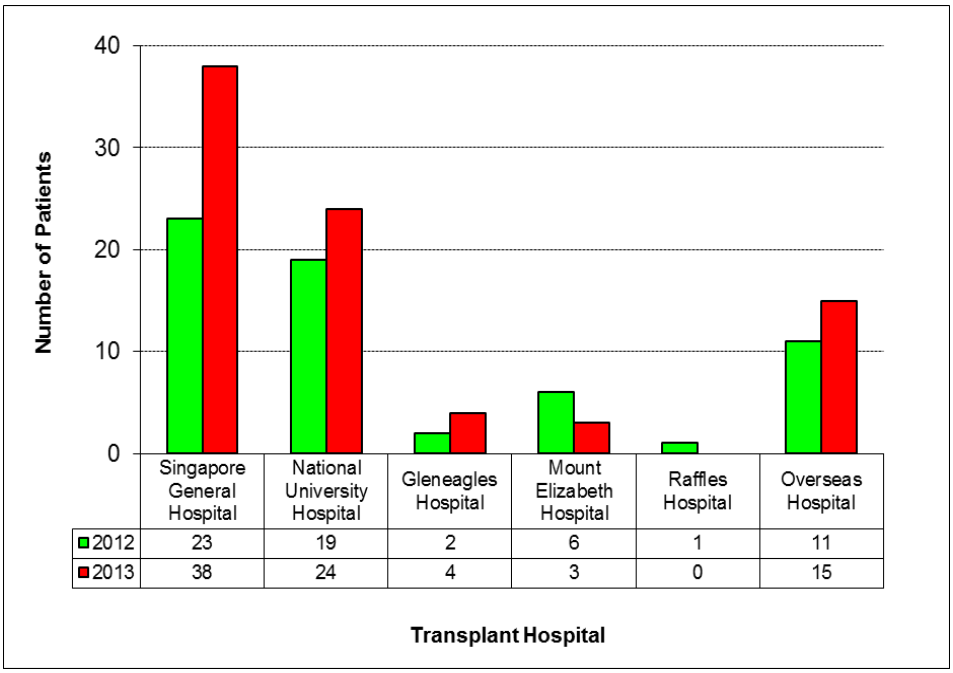
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
DM	24.4	23.8	23.6	24.2	24.7	24.6	25.9	26.0	27.0	27.1	26.9	26.8	26.1	26.8	26.0
IHD	9.8	9.9	10.9	12.0	12.2	12.9	13.6	14.2	14.7	15.6	15.3	15.5	15.6	16.1	15.7
CVD	2.8	2.7	2.6	2.6	2.8	3.0	3.1	3.9	4.1	4.4	4.2	4.5	4.7	4.8	5.2
PVD	1.1	0.8	0.9	1.1	1.1	1.0	1.4	1.6	1.6	1.7	1.7	1.8	1.9	2.3	2.3

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 (37.1% in 2012, 45.2% in 2013). However, about 18% of the transplants were performed at overseas centres in 2012 and 2013. See Figure 9.4.1.1.

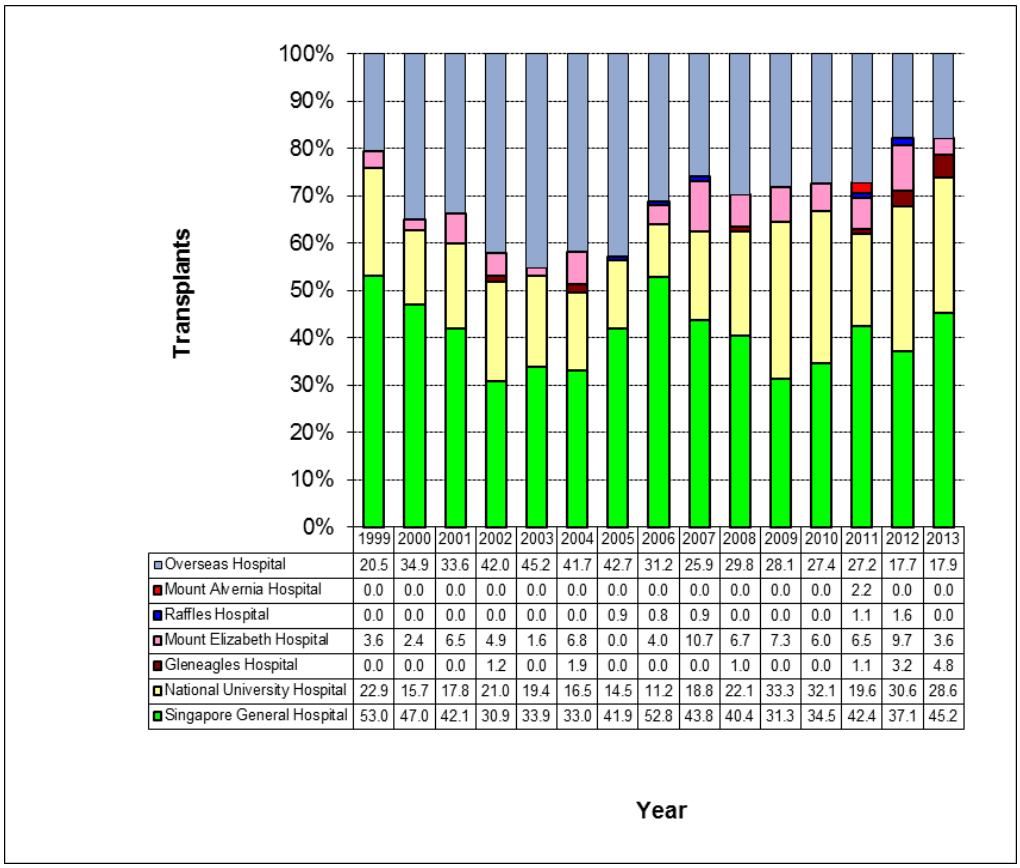
Figure 9.4.1.1: INCIDENT TRANSPLANTS BY TRANSPLANT HOSPITAL



	Singapore General Hospital	National University Hospital	Gleneagles Hospital	Mount Elizabeth Hospital	Raffles Hospital	Overseas Hospital
2012	23	19	2	6	1	11
2013	38	24	4	3	0	15

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 trend can be seen in Figure 9.4.1.2.

Figure 9.4.1.2: INCIDENT TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2013

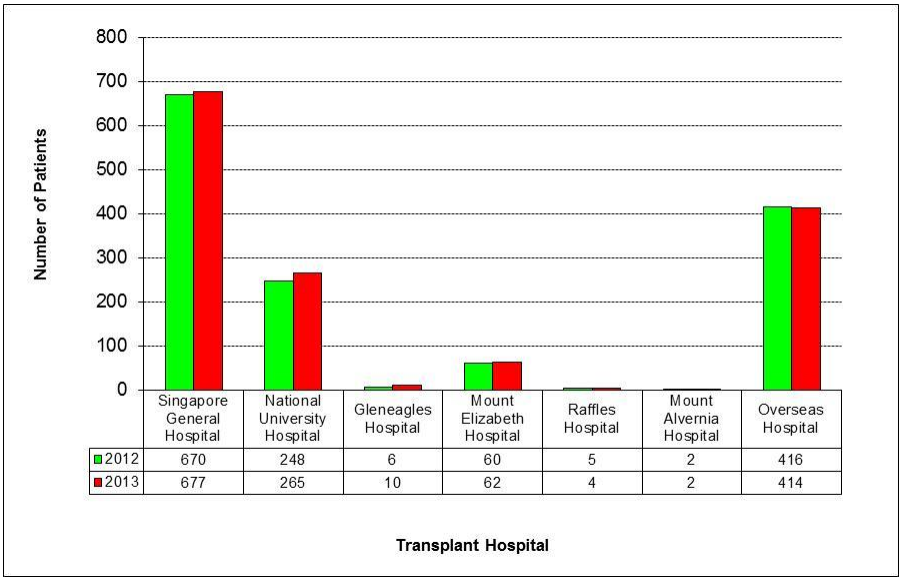


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	20.5	34.9	33.6	42.0	45.2	41.7	42.7	31.2	25.9	29.8	28.1	27.4	27.2	17.7	17.9
Mount Alvernia Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0
Raffles Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.8	0.9	0.0	0.0	0.0	1.1	1.6	0.0
Mount Elizabeth Hospital	3.6	2.4	6.5	4.9	1.6	6.8	0.0	4.0	10.7	6.7	7.3	6.0	6.5	9.7	3.6
Gleneagles Hospital	0.0	0.0	0.0	1.2	0.0	1.9	0.0	0.0	0.0	1.0	0.0	0.0	1.1	3.2	4.8
National University Hospital	22.9	15.7	17.8	21.0	19.4	16.5	14.5	11.2	18.8	22.1	33.3	32.1	19.6	30.6	28.6
Singapore General Hospital	53.0	47.0	42.1	30.9	33.9	33.0	41.9	52.8	43.8	40.4	31.3	34.5	42.4	37.1	45.2

9.4.2 Prevalent Transplant Patients

Among the prevalent transplant population, the majority had been performed at the Singapore General Hospital (47.6% in 2012, 47.2% in 2013). See Figure 9.4.2.1.

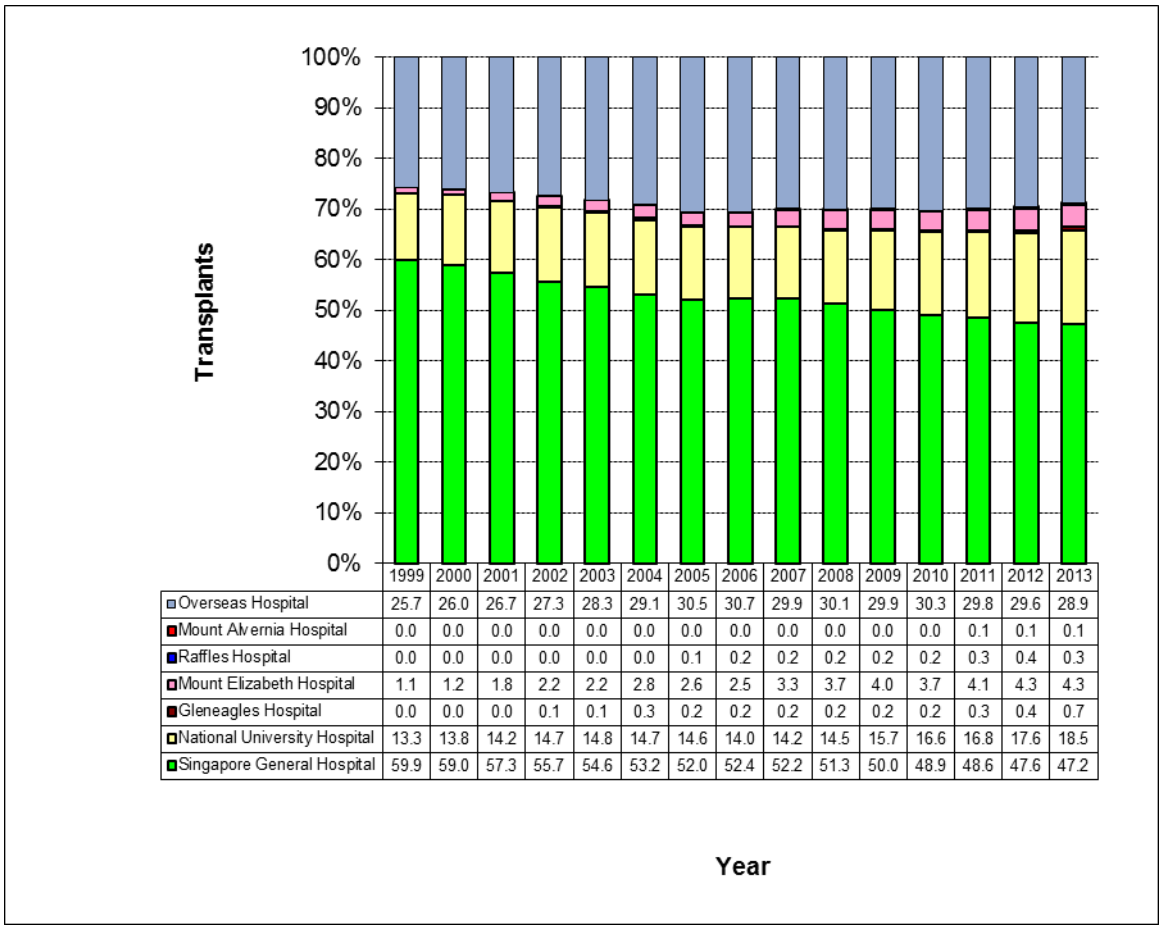
Figure 9.4.2.1: PREVALENT TRANSPLANTS BY TRANSPLANT HOSPITAL



	Singapore General Hospital	National University Hospital	Gleneagles Hospital	Mount Elizabeth Hospital	Raffles Hospital	Mount Alvernia Hospital	Overseas Hospital
2012	670	248	6	60	5	2	416
2013	677	265	10	62	4	2	414

For the period 1999 to 2013, 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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	25.7	26.0	26.7	27.3	28.3	29.1	30.5	30.7	29.9	30.1	29.9	30.3	29.8	29.6	28.9
Mount Alvernia Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Raffles Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3
Mount Elizabeth Hospital	1.1	1.2	1.8	2.2	2.2	2.8	2.6	2.5	3.3	3.7	4.0	3.7	4.1	4.3	4.3
Gleneagles Hospital	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.7
National University Hospital	13.3	13.8	14.2	14.7	14.8	14.7	14.6	14.0	14.2	14.5	15.7	16.6	16.8	17.6	18.5
Singapore General Hospital	59.9	59.0	57.3	55.7	54.6	53.2	52.0	52.4	52.2	51.3	50.0	48.9	48.6	47.6	47.2

9.5 Donor Type and Source

Among incident patients transplanted locally, 28 (45.2%) in 2012 had received deceased-donor renal transplants. At the end of year 2012, 907 of 1,407 prevalent patients (64.4%) had received deceased-donor transplants. See Tables 9.5.1 and 9.5.3.

Among incident patients transplanted locally, 38 (45.2%) in 2013 had received deceased-donor renal transplants. At the end of year 2013, 900 of 1,434 prevalent patients (62.8%) 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

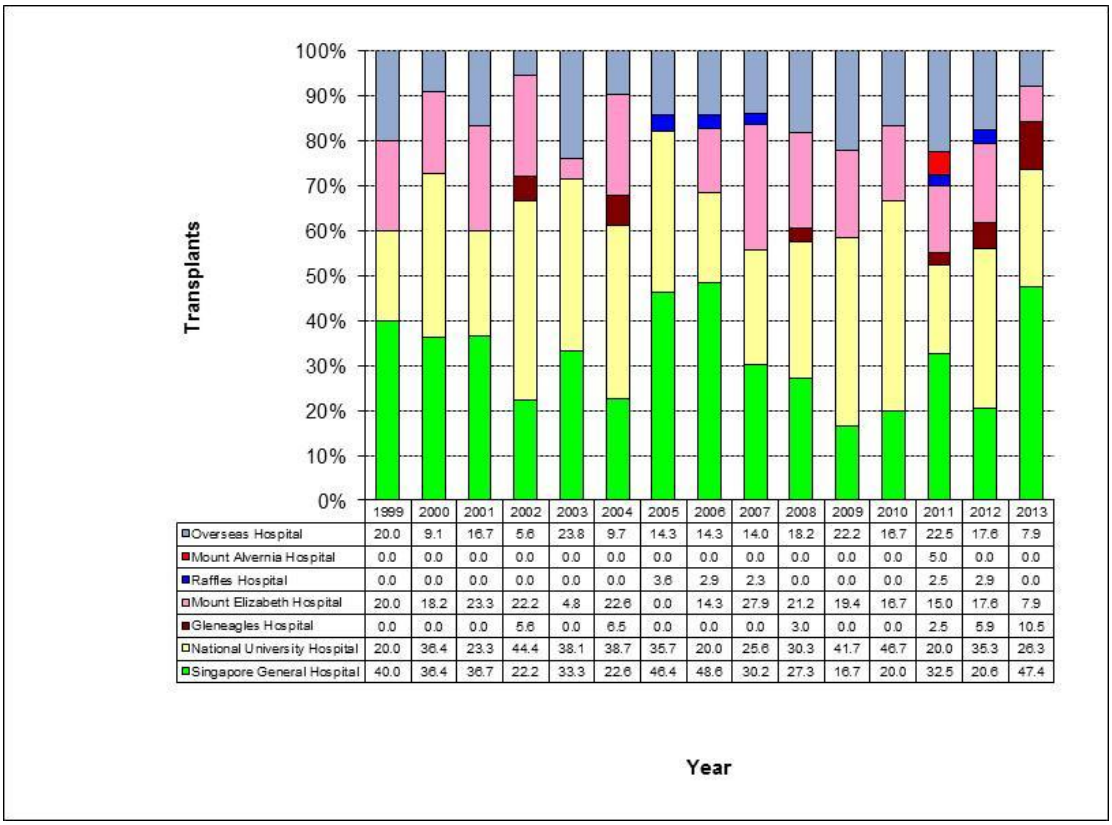
2012 HOSPITAL	Living-Donor		Deceased-Donor		Unknown		All Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	7	20.6	16	57.1	0	0.0	23	37.1
National University Hospital	12	35.3	7	25.0	0	0.0	19	30.6
Gleneagles Hospital	2	5.9	0	0.0	0	0.0	2	3.2
Mount Elizabeth Hospital	6	17.6	0	0.0	0	0.0	6	9.7
Raffles Hospital	1	2.9	0	0.0	0	0.0	1	1.6
Overseas Hospital	6	17.6	5	17.9	0	0.0	11	17.7
All Transplant Hospitals	**34**	**100**	**28**	**100**	**0**	**0**	**62**	**100**

2013 HOSPITAL	Living-Donor		Deceased-Donor		Unknown		All Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	18	47.4	20	52.6	0	0.0	38	45.2
National University Hospital	10	26.3	14	36.8	0	0.0	24	28.6
Gleneagles Hospital	4	10.5	0	0.0	0	0.0	4	4.8
Mount Elizabeth Hospital	3	7.9	0	0.0	0	0.0	3	3.6
Raffles Hospital	0	0.0	0	0.0	0	0.0	0	0.0
Overseas Hospital	3	7.9	4	10.5	8	100.0	15	17.9
All Transplant Hospitals	**38**	**100**	**38**	**100**	**8**	**100**	**84**	**100**

† 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 the Singapore General Hospital and the National University Hospital in 1999-2013. See Figure 9.5.1.

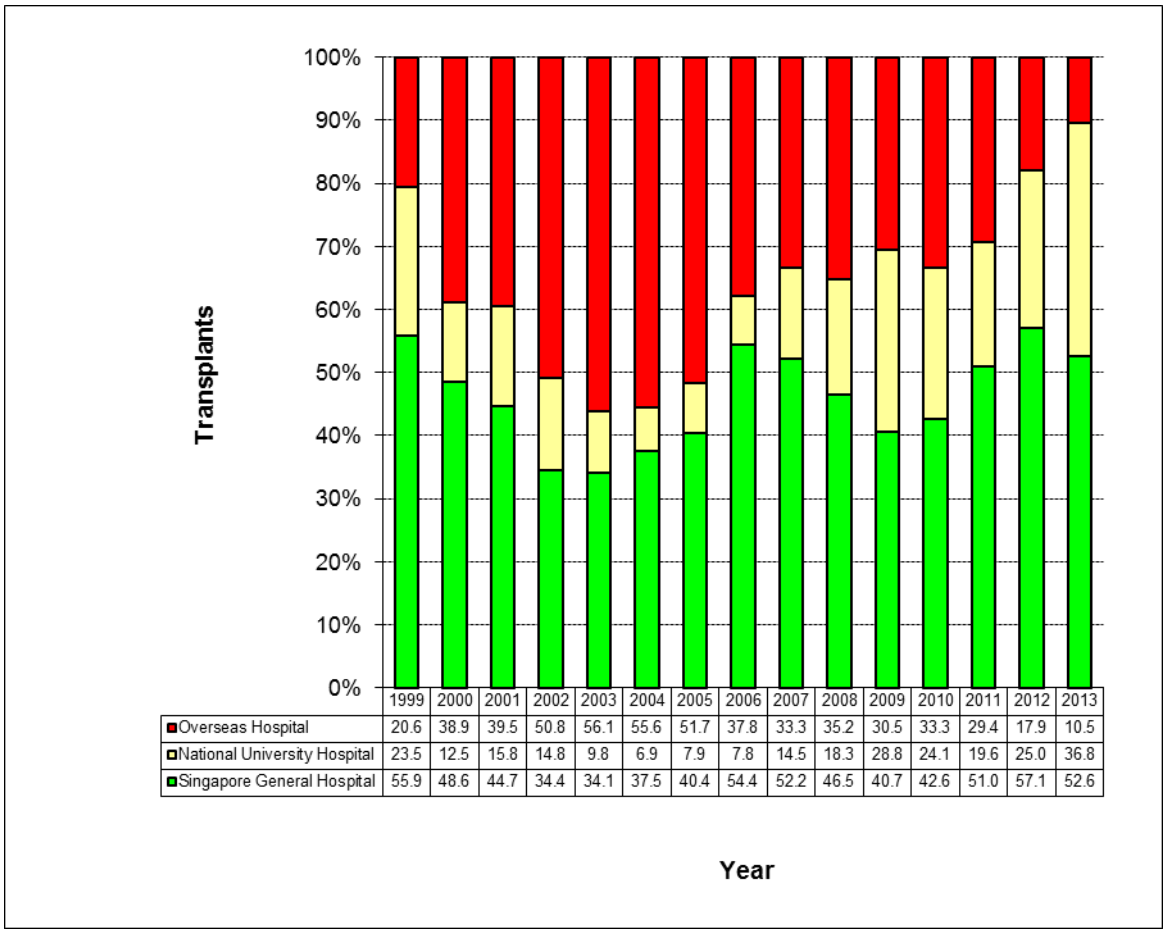
Figure 9.5.1: INCIDENT LIVING-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	20.0	9.1	16.7	5.6	23.8	9.7	14.3	14.3	14.0	18.2	22.2	16.7	22.5	17.6	7.9
Mount Alvernia Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0
Raffles Hospital	0.0	0.0	0.0	0.0	0.0	0.0	3.6	2.9	2.3	0.0	0.0	0.0	2.5	2.9	0.0
Mount Elizabeth Hospital	20.0	18.2	23.3	22.2	4.8	22.6	0.0	14.3	27.9	21.2	19.4	16.7	15.0	17.6	7.9
Gleneagles Hospital	0.0	0.0	0.0	5.6	0.0	6.5	0.0	0.0	0.0	3.0	0.0	0.0	2.5	5.9	10.5
National University Hospital	20.0	36.4	23.3	44.4	38.1	38.7	35.7	20.0	25.6	30.3	41.7	46.7	20.0	35.3	26.3
Singapore General Hospital	40.0	36.4	36.7	22.2	33.3	22.6	46.4	48.6	30.2	27.3	16.7	20.0	32.5	20.6	47.4

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 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	20.6	38.9	39.5	50.8	56.1	55.6	51.7	37.8	33.3	35.2	30.5	33.3	29.4	17.9	10.5
National University Hospital	23.5	12.5	15.8	14.8	9.8	6.9	7.9	7.8	14.5	18.3	28.8	24.1	19.6	25.0	36.8
Singapore General Hospital	55.9	48.6	44.7	34.4	34.1	37.5	40.4	54.4	52.2	46.5	40.7	42.6	51.0	57.1	52.6

Among incident living-donor transplants, the majority were biologically related (55.9% in 2012, 63.2% in 2013). See Table 9.5.2.

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

2012 HOSPITAL	Biologically Related		Emotionally Related		Neither		All Living Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	6	31.6	1	12.5	0	0.0	7	20.6
National University Hospital	7	36.8	4	50.0	1	14.3	12	35.3
Gleneagles Hospital	0	0.0	2	25.0	0	0.0	2	5.9
Mount Elizabeth Hospital	5	26.3	1	12.5	0	0.0	6	17.6
Raffles Hospital	1	5.3	0	0.0	0	0.0	1	2.9
Overseas Hospital	0	0.0	0	0.0	6	85.7	6	17.6
All Transplant Hospitals	**19**	**100**	**8**	**100**	**7**	**100**	**34**	**100**

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

2013 HOSPITAL	Biologically Related		Emotionally Related		Neither		All Living Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	10	41.7	8	61.5	0	0.0	18	47.4
National University Hospital	7	29.2	3	23.1	0	0.0	10	26.3
Gleneagles Hospital	4	16.7	0	0.0	0	0.0	4	10.5
Mount Elizabeth Hospital	1	4.2	2	15.4	0	0.0	3	7.9
Raffles Hospital	0	0.0	0	0.0	0	0.0	0	0.0
Overseas Hospital	2	8.3	0	0.0	1	100.0	3	7.9
All Transplant Hospitals	**24**	**100**	**13**	**100**	**1**	**100**	**38**	**100**

Table 9.5.3 shows the breakdown of living donors (Singapore residents) who made the donations locally by age and gender. There were 28 such donors who donated locally in 2012, and 35 in 2013. In 2012, 32.1% of the donors were aged 30-39 years and 28.6% aged 60-69 years. In 2013, 40.0% of the donors were aged 40-49 years and 37.1% were aged 50-59 years.

Table 9.5.3: INCIDENT LIVING DONORS BY AGE GROUP AND GENDER

Age Group	2012						2013					
	Male		Female		Both Genders		Male		Female		Both Genders	
	No	%	No	%	No	%	No	%	No	%	No	%
0-19	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
20-29	3	27.3	1	5.9	4	14.3	1	7.1	1	4.8	2	5.7
30-39	4	36.4	5	29.4	9	32.1	3	21.4	1	4.8	4	11.4
40-49	0	0.0	2	11.8	2	7.1	7	50.0	7	33.3	14	40.0
50-59	1	9.1	4	23.5	5	17.9	2	14.3	11	52.4	13	37.1
60-69	3	27.3	5	29.4	8	28.6	1	7.1	1	4.8	2	5.7
70-79	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
80+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	**11**	**100**	**17**	**100**	**28**	**100**	**14**	**100**	**21**	**100**	**35**	**100**

Table 9.5.4 shows the breakdown of living donors (Singapore residents) who made the donations locally by their highest education level attained and gender. In 2012, 32.1% of the donors reported “University and above” and 28.6% reported “GCE O Level” as their highest education level. In 2013, 28.6% of the donors reported “University and above” and 22.9% reported “Secondary (No O Level Cert)” as their highest education level.

Table 9.5.4: INCIDENT LIVING DONORS BY HIGHEST EDUCATION LEVEL AND GENDER

Highest Education Level	2012						2013					
	Male		Female		Both Genders		Male		Female		Both Genders	
	No	%	No	%	No	%	No	%	No	%	No	%
No Formal Education	0	0.0	0	0.0	0	0.0	0	0.0	1	4.8	1	2.9
PSLE Certificate	1	9.1	2	11.8	3	10.7	0	0.0	4	19.0	4	11.4
Secondary (No O Level Cert)	1	9.1	1	5.9	2	7.1	2	14.3	6	28.6	8	22.9
GCE N level	1	9.1	0	0.0	1	3.6	0	0.0	1	4.8	1	2.9
GCE O level	2	18.2	6	35.3	8	28.6	2	14.3	2	9.5	4	11.4
GCE A level	0	0.0	0	0.0	0	0.0	0	0.0	1	4.8	1	2.9
Diploma	1	9.1	4	23.5	5	17.9	5	35.7	1	4.8	6	17.1
University and above	5	45.5	4	23.5	9	32.1	5	35.7	5	23.8	10	28.6
Total	**11**	**100**	**17**	**100**	**28**	**100**	**14**	**100**	**21**	**100**	**35**	**100**

Table 9.5.5 shows the breakdown of living donors (Singapore residents) who made the donations locally by their relationship to recipients and gender. In 2012, 28.6% of the donors were parents or siblings to the recipients respectively. In 2013, 34.3% of the donors were siblings and 28.6% were parents or spouse to the recipients respectively.

Table 9.5.5: INCIDENT LIVING DONORS BY RELATIONSHIP TO RECIPIENTS AND GENDER

Relationship to Recipients	2012						2013					
	Male		Female		Both Genders		Male		Female		Both Genders	
	No	%	No	%	No	%	No	%	No	%	No	%
Parent	2	18.2	6	35.3	8	28.6	5	35.7	5	23.8	10	28.6
Sibling	1	9.1	7	41.2	8	28.6	5	35.7	7	33.3	12	34.3
Identical Twin	0	0.0	1	5.9	1	3.6	0	0.0	0	0.0	0	0.0
Offspring	1	9.1	1	5.9	2	7.1	0	0.0	0	0.0	0	0.0
Friend	1	9.1	0	0.0	1	3.6	1	7.1	1	4.8	2	5.7
Spouse	5	45.5	2	11.8	7	25.0	3	21.4	7	33.3	10	28.6
Directed	1	9.1	0	0.0	1	3.6	0	0.0	0	0.0	0	0.0
Others	0	0.0	0	0.0	0	0.0	0	0.0	1	4.8	1	2.9
Total	**11**	**100**	**17**	**100**	**28**	**100**	**14**	**100**	**21**	**100**	**35**	**100**

Among prevalent patients, the majority of the transplants had been performed at the Singapore General Hospital (670 in 2012, 677 in 2013). Of note, approximately one third of prevalent patients (416 in 2012, 414 in 2013) have received renal transplantation at overseas hospitals. See Table 9.5.6.

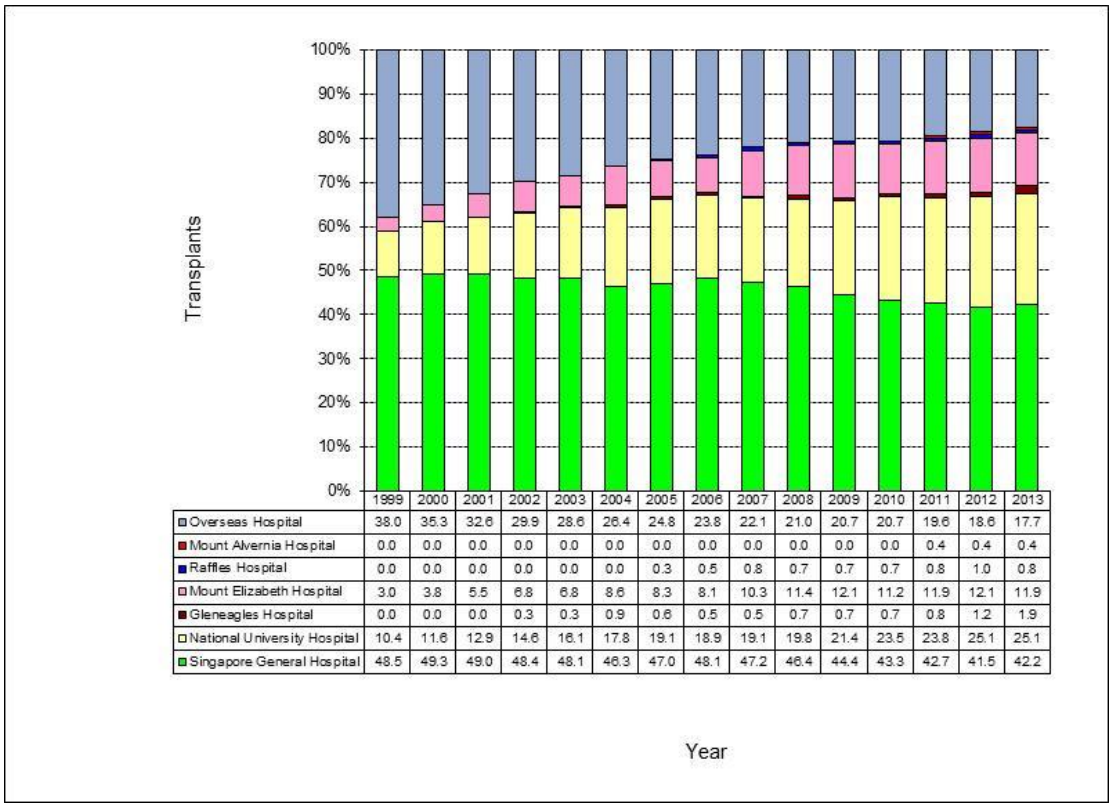
Table 9.5.6: PREVALENT TRANSPLANTS BY DONOR TYPE AND TRANSPLANT HOSPITAL

2012	Living-Donor		Deceased-Donor		Unknown		All Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	205	41.5	465	51.3	0	0.0	670	47.6
National University Hospital	124	25.1	124	13.7	0	0.0	248	17.6
Gleneagles Hospital	6	1.2	0	0.0	0	0.0	6	0.4
Mount Elizabeth Hospital	60	12.1	0	0.0	0	0.0	60	4.3
Raffles Hospital	5	1.0	0	0.0	0	0.0	5	0.4
Mount Alvernia Hospital	2	0.4	0	0.0	0	0.0	2	0.1
Overseas Hospital	92	18.6	318	35.1	6	100.0	416	29.6
All Transplant Hospitals	**494**	**100**	**907**	**100**	**6**	**100**	**1407**	**100**

2013	Living-Donor		Deceased-Donor		Unknown		All Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	220	42.2	457	50.8	0	0.0	677	47.2
National University Hospital	131	25.1	134	14.9	0	0.0	265	18.5
Gleneagles Hospital	10	1.9	0	0.0	0	0.0	10	0.7
Mount Elizabeth Hospital	62	11.9	0	0.0	0	0.0	62	4.3
Raffles Hospital	4	0.8	0	0.0	0	0.0	4	0.3
Mount Alvernia Hospital	2	0.4	0	0.0	0	0.0	2	0.1
Overseas Hospital	92	17.7	309	34.3	13	100.0	414	28.9
All Transplant Hospitals	**521**	**100**	**900**	**100**	**13**	**100**	**1434**	**100**

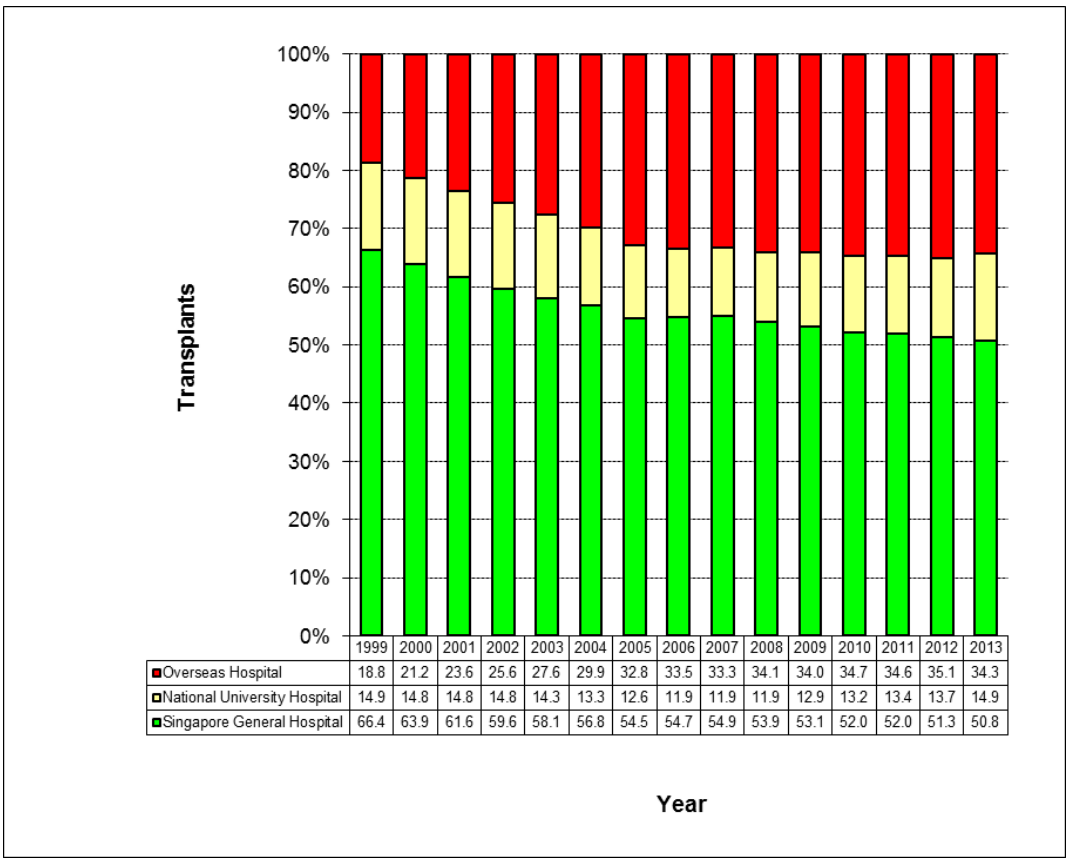
Majority of the living and deceased-donor prevalent transplants had undergone transplantation at the Singapore General Hospital for the period 1999 to 2013. Of the prevalent living-donor transplants, 17.7% of them sought transplants overseas in 2013. Although there was no significant trend in the numbers of incident living-donor transplants from overseas hospitals (See Figure 9.5.1), there was a definite decreasing trend 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.

Figure 9.5.3: PREVALENT LIVING-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	38.0	35.3	32.6	29.9	28.6	26.4	24.8	23.8	22.1	21.0	20.7	20.7	19.6	18.6	17.7
Mount Alvernia Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4
Raffles Hospital	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.8	0.7	0.7	0.7	0.8	1.0	0.8
Mount Elizabeth Hospital	3.0	3.8	5.5	6.8	6.8	8.6	8.3	8.1	10.3	11.4	12.1	11.2	11.9	12.1	11.9
Gleneagles Hospital	0.0	0.0	0.0	0.3	0.3	0.9	0.6	0.5	0.5	0.7	0.7	0.7	0.8	1.2	1.9
National University Hospital	10.4	11.6	12.9	14.6	16.1	17.8	19.1	18.9	19.1	19.8	21.4	23.5	23.8	25.1	25.1
Singapore General Hospital	48.5	49.3	49.0	48.4	48.1	46.3	47.0	48.1	47.2	46.4	44.4	43.3	42.7	41.5	42.2

Figure 9.5.4: PREVALENT DECEASED-DONOR TRANSPLANTS BY TRANSPLANT HOSPITAL, 1999 – 2013



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Overseas Hospital	18.8	21.2	23.6	25.6	27.6	29.9	32.8	33.5	33.3	34.1	34.0	34.7	34.6	35.1	34.3
National University Hospital	14.9	14.8	14.8	14.8	14.3	13.3	12.6	11.9	11.9	11.9	12.9	13.2	13.4	13.7	14.9
Singapore General Hospital	66.4	63.9	61.6	59.6	58.1	56.8	54.5	54.7	54.9	53.9	53.1	52.0	52.0	51.3	50.8

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 9.5.7.

Table 9.5.7: PREVALENT LIVING-DONOR TRANSPLANTS BY DONOR SOURCE AND TRANSPLANT HOSPITAL

2012 HOSPITAL	Biologically Related		Emotionally Related		Neither		All Living Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	160	54.1	44	35.5	1	1.4	205	41.5
National University Hospital	79	26.7	44	35.5	1	1.4	124	25.1
Gleneagles Hospital	3	1.0	3	2.4	0	0.0	6	1.2
Mount Elizabeth Hospital	33	11.1	24	19.4	3	4.1	60	12.1
Raffles Hospital	3	1.0	2	1.6	0	0.0	5	1.0
Mount Alvernia Hospital	2	0.7	0	0.0	0	0.0	2	0.4
Overseas Hospital	16	5.4	7	5.6	69	93.2	92	18.6
All Transplant Hospitals	**296**	**100**	**124**	**100**	**74**	**100**	**494**	**100**

2013 HOSPITAL	Biologically Related		Emotionally Related		Neither		All Living Donors	
	No	%	No	%	No	%	No	%
Singapore General Hospital	168	53.2	51	38.6	1	1.4	220	42.2
National University Hospital	85	26.9	45	34.1	1	1.4	131	25.1
Gleneagles Hospital	7	2.2	3	2.3	0	0.0	10	1.9
Mount Elizabeth Hospital	34	10.8	25	18.9	3	4.1	62	11.9
Raffles Hospital	3	0.9	1	0.8	0	0.0	4	0.8
Mount Alvernia Hospital	2	0.6	0	0.0	0	0.0	2	0.4
Overseas Hospital	17	5.4	7	5.3	68	93.2	92	17.7
All Transplant Hospitals	**316**	**100**	**132**	**100**	**73**	**100**	**521**	**100**

9.6 Graft and Patient Outcomes

9.6.1 Demographics for Transplant Deaths

There were 30 deaths amongst transplant patients in 2012 and 39 deaths in 2013. 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 2.1% in 2012 and 2.7% in 2013. 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 50 to 59 years for both genders. See Table 9.6.1.1.

Table 9.6.1.1: TRANSPLANT DEATHS BY AGE GROUP AND GENDER

2012 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	0	0.0	0	0.0	0	0.0
20–29	1	5.3	0	0.0	1	3.3
30–39	0	0.0	0	0.0	0	0.0
40–49	0	0.0	2	18.2	2	6.7
50–59	8	42.1	5	45.5	13	43.3
60–69	8	42.1	3	27.3	11	36.7
70–79	2	10.5	1	9.1	3	10.0
80 +	0	0.0	0	0.0	0	0.0
All Age Groups	**19**	**100**	**11**	**100**	**30**	**100**

2013 AGE GROUP	Male		Female		Both Genders	
	No	%	No	%	No	%
0–19	1	4.3	0	0.0	1	2.6
20–29	0	0.0	1	6.3	1	2.6
30–39	0	0.0	0	0.0	0	0.0
40–49	1	4.3	3	18.8	4	10.3
50–59	10	43.5	3	18.8	13	33.3
60–69	7	30.4	4	25.0	11	28.2
70–79	4	17.4	4	25.0	8	20.5
80 +	0	0.0	1	6.3	1	2.6
All Age Groups	**23**	**100**	**16**	**100**	**39**	**100**

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

2012	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	17	89.5	9	81.8	26	86.7
Malay	1	5.3	1	9.1	2	6.7
Indian	1	5.3	1	9.1	2	6.7
Others	0	0.0	0	0.0	0	0.0
All Ethnic Groups	**19**	**100**	**11**	**100**	**30**	**100**

2013	Male		Female		Both Genders	
	No	%	No	%	No	%
Chinese	21	91.3	13	81.3	34	87.2
Malay	0	0.0	1	6.3	1	2.6
Indian	2	8.7	2	12.5	4	10.3
Others	0	0.0	0	0.0	0	0.0
All Ethnic Groups	**23**	**100**	**16**	**100**	**39**	**100**

9.6.2 Cause of Death

Infection accounted for 40.0% of deaths in 2012 and 41.0% in 2013, while cardiac events (acute myocardial infarct, acute pulmonary oedema and other cardiac causes) accounted for 23.4% of deaths in 2012 and 12.8% in 2013. See Table 9.6.2.1.

Table 9.6.2.1: CAUSE OF DEATH IN TRANSPLANT PATIENTS

Cause of Death	2012		2013	
	No	%	No	%
Acute Myocardial Infarct (AMI)	5	16.7	2	5.1
Acute Pulmonary Oedema (APO)	0	0.0	0	0.0
Other Cardiac	2	6.7	3	7.7
Cerebrovascular Accident (CVA)	0	0.0	1	2.6
Infections	12	40.0	16	41.0
Liver Failure	0	0.0	2	5.1
Other Haemorrhage	2	6.7	0	0.0
Malignancy	7	23.3	7	17.9
Withdraw dialysis	0	0.0	0	0.0
Uremia	2	6.7	4	10.3
Accidental/Homicide	0	0.0	2	5.1
Other Social	0	0.0	0	0.0
Died at Home	0	0.0	0	0.0
Hyperkalemia (cardiac standstill)	0	0.0	0	0.0
Bleeding from the Gastro-intestinal Tract (BGIT)	0	0.0	0	0.0
Other	0	0.0	0	0.0
Unknown	0	0.0	2	5.1
Total	**30**	**100**	**39**	**100**

9.6.3 Cause of Graft Failure

There were 32 graft failures among the transplant patients in 2012 and 20 in 2013. The greatest proportion of graft failure was due to chronic rejection (50.0% in both 2012 and 2013), followed by chronic allograft nephropathy (18.8% in 2012, 35.0% in 2013). See Table 9.6.3.1.

Table 9.6.3.1: CAUSE OF GRAFT FAILURE IN TRANSPLANT PATIENTS

Cause of Graft Failure	2012		2013	
	No	%	No	%
Chronic Rejection	16	50.0	10	50.0
Acute rejection	6	18.8	0	0.0
Graft thrombosis	0	0.0	1	5.0
Chronic allograft nephropathy	6	18.8	7	35.0
Infection	1	3.1	0	0.0
Non-compliance	1	3.1	0	0.0
Others/Unknown	2	6.3	2	10.0
All Causes of Graft Failure	**32**	**100**	**20**	**100**

9.6.4 Survival Analysis

The chances of surviving 1 year and 5 years with a functioning graft for transplanted patients were 97.8% and 92.5% respectively. The corresponding 1 and 5-year graft survivals were 94.8% and 89.4% respectively. See Table 9.6.4.1.

Table 9.6.4.1: GRAFT AND PATIENT SURVIVAL, 1999 – 2013

YEAR OF TRANSPLANT 1999–2013	SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Graft	94.8	93.2 – 96.0	89.4	87.2 – 91.3	Not reached
Patient	97.8	96.7 – 98.5	92.5	90.5 – 94.1	Not reached

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 – 2013

YEAR OF TRANSPLANT 1999–2013	SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Graft					
Local living-donor	98.3	96.3 – 99.2	95.1	92.0 – 97.0	Not reached
Local deceased-donor	92.3	89.8 – 94.2	86.0	82.7 – 88.7	Not reached
Patient					
Local living-donor	98.9	97.0 – 99.6	95.7	92.6 – 97.5	Not reached
Local deceased-donor	96.8	95.0 – 98.0	90.3	87.4 – 92.6	Not reached

Figure 9.6.4.1: GRAFT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2013

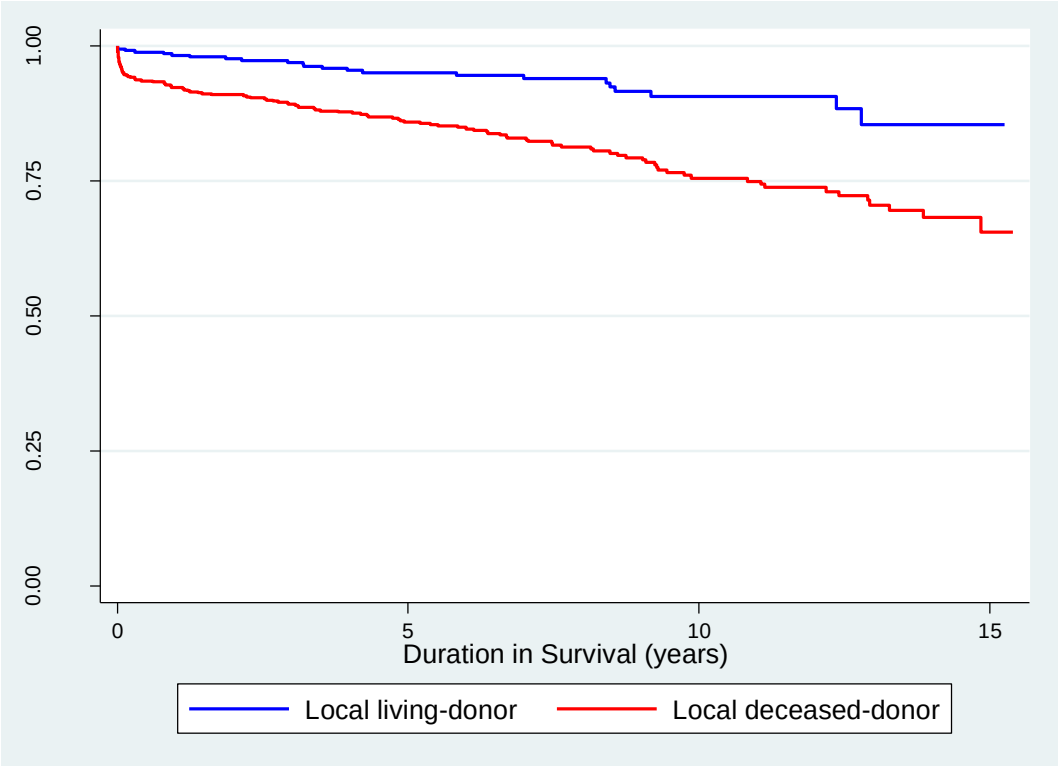
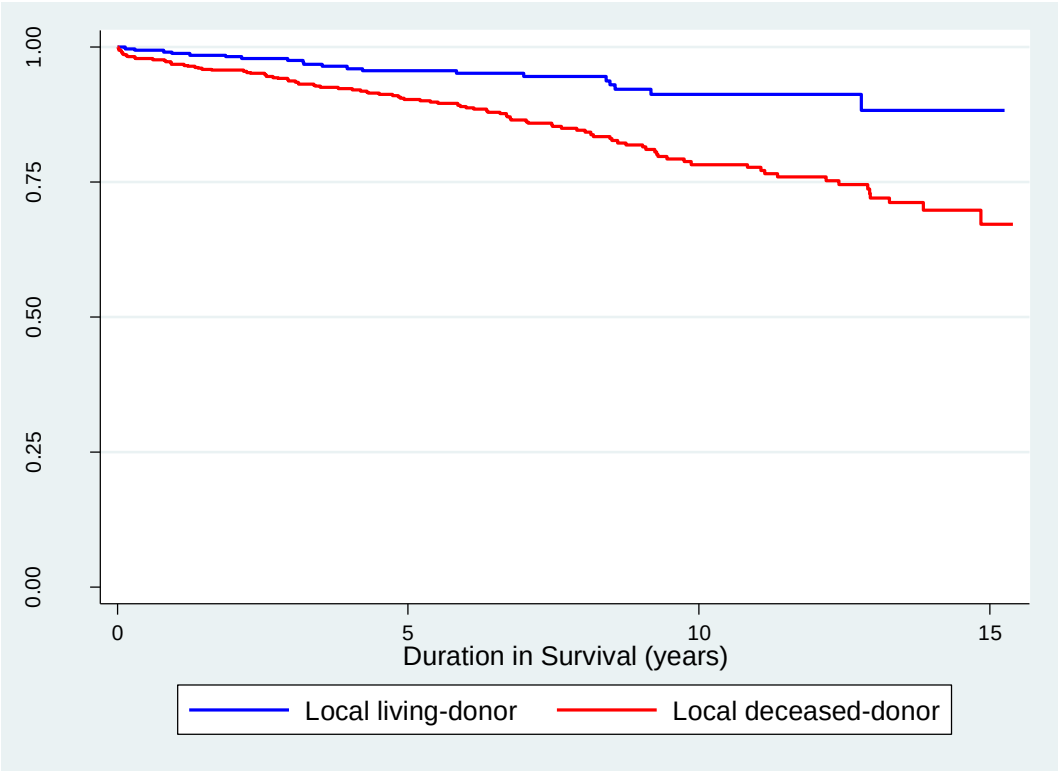


Figure 9.6.4.2: PATIENT SURVIVAL BY TYPE OF RENAL TRANSPLANT, 1999 – 2013



Although graft and patient survival was comparable at 1 year, both graft and patient survival was poorer at 5 years for patients with DN. See Table 9.6.4.3.

Table 9.6.4.3: GRAFT AND PATIENT SURVIVAL BY AETIOLOGY OF RENAL FAILURE AMONG RENAL TRANSPLANTS, 1999 – 2013

YEAR OF TRANSPLANT 1999–2013	GRAFT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Diabetic Nephropathy	98.5	89.7 – 99.8	77.5	63.4 – 86.7	Not reached
Non-diabetic Nephropathy	94.5	92.8 – 95.8	90.2	88.0 – 92.1	Not reached

P=0.11

YEAR OF TRANSPLANT 1999–2013	PATIENT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Diabetic Nephropathy	98.5	89.7 – 99.8	77.5	63.4 – 86.7	Not reached
Non-diabetic Nephropathy	97.7	96.5 – 98.5	93.6	91.6 – 95.1	Not reached

P=0.01

There was no significant difference in graft and patient survival between the genders. Chinese had the best graft and patient survival among the three ethnic groups. See Tables 9.6.4.4 and 9.6.4.5. Patients aged below 60 years had better 5-years graft and patient survival than those over age 60. See Table 9.6.4.6.

Table 9.6.4.4: GRAFT AND PATIENT SURVIVAL BY GENDER, 1999 – 2013

YEAR OF TRANSPLANT 1999–2013	GRAFT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Males	94.5	92.1 – 96.1	89.7	86.6 – 92.1	Not reached
Females	95.2	92.8 – 96.8	89.1	85.6 – 91.7	Not reached

P=0.31

YEAR OF TRANSPLANT 1999–2013	PATIENT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Males	97.3	95.5 – 98.4	92.8	90.1 – 94.8	Not reached
Females	98.3	96.6 – 99.2	92.2	89.0 – 94.5	Not reached

P=0.37

Table 9.6.4.5: GRAFT AND PATIENT SURVIVAL BY ETHNIC GROUP, 1999 – 2013

YEAR OF TRANSPLANT 1999–2013	GRAFT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Chinese	95.6	93.9 – 96.9	90.9	88.5 – 92.9	Not reached
Malay	91.7	86.2 – 95.1	86.3	79.5 – 91.0	Not reached
Indian	93.3	85.7 – 96.9	82.3	71.7 – 89.2	Not reached

P=0.43

YEAR OF TRANSPLANT 1999–2013	PATIENT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
Chinese	97.9	96.5 – 98.7	93.1	90.9 – 94.8	Not reached
Malay	97.5	93.4 – 99.0	92.1	86.1 – 95.6	Not reached
Indian	97.8	91.4 – 99.4	88.3	78.5 – 93.8	Not reached

P=0.86

Table 9.6.4.6: GRAFT AND PATIENT SURVIVAL BY AGE GROUP, 1999 – 2013

YEAR OF TRANSPLANT 1999–2013	GRAFT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
< 60	94.7	93.0 – 95.9	89.5	87.2 – 91.3	Not reached
≥ 60	97.6	83.9 – 99.7	87.9	70.3 – 95.4	Not reached

P=0.65

YEAR OF TRANSPLANT 1999–2013	PATIENT SURVIVAL				Median Survival (Years)
	1 YEAR (%)	95% C.I.	5 YEAR (%)	95% C.I.	
< 60	97.8	96.6 – 98.6	92.7	90.7 – 94.3	Not reached
≥ 60	97.6	83.9 – 99.7	87.9	70.3 – 95.4	Not reached

P=0.22

10 APPENDICES

10.1 APPENDIX I

10.1.1 SRR Form

DIAGNOSIS OR COMMENCEMENT OF TREATMENT OF CHRONIC KIDNEY FAILURE NOTIFICATION FORM

SINGAPORE RENAL REGISTRY

National Registry of Diseases Office
Health Promotion Board
Level 5, 3 Second Hospital Avenue
Singapore 168937
Tel: (65) 6435 3078 / 3061 / 3077 or E-mail: hpb_servicenrdo@hpb.gov.sg

SRR No. ☐☐☐☐☐☐☐☐☐☐
Registry use

E-Notification: www.hpp.moh.gov.sg

1. REFERRING OR TREATING HEALTHCARE INSTITUTION

Referral Clinic / Centre: _____ ☐☐☐

Current Centre: _____ ☐☐☐

Date treatment started at current centre: _____ (ddmmyyyy)

Current modality of treatment: ☐ HD ☐ APD ☐ CAPD ☐ TRANSPLANT ☐ CONSERVATIVE TREATMENT
☐ OTHERS, Please specify: _____

2. PARTICULARS OF PATIENT

Name*:

NRIC/ Passport No/FIN/Hospital Registration No*: ☐☐☐☐☐☐☐☐☐☐

Resident Status: ☐ Singapore Citizen ☐ Singapore PR ☐ Others, specify: _____

Date of Birth*: (ddmmyyyy) ☐☐☐☐☐☐☐☐

Gender*: ☐ Male ☐ Female

Residential Postal code: ☐☐☐☐☐☐

Country of Birth: ☐ Singapore ☐ China ☐ Malaysia ☐ Others, specify: _____
☐ Indonesia ☐ India ☐ Unknown

Ethnic Group: ☐ Chinese ☐ Malay ☐ Indian ☐ Eurasian
☐ Others, specify: _____

Religion: ☐ Buddhist ☐ Christian ☐ Muslim ☐ Hindu ☐ Sikh
☐ Taoist ☐ Free thinker ☐ Others, specify: _____ ☐ Missing

Highest Educational Level:

☐ Not available	☐ Pre-school	☐ ITE	☐ GCE A Level / IB
☐ No Formal Education	☐ Low Primary	☐ GCE N Level	☐ Diploma
☐ Special School	☐ PSLE / Secondary	☐ GCE O Level	☐ University and above

*Mandatory data items

3. DIAGNOSTIC INFORMATION

Primary Renal Disease leading to Chronic Kidney Failure: _____

Date reached Chronic Kidney Failure: ☐☐☐☐☐☐☐☐

GFR/ eGFR# at diagnosis: _____ml/min/1.73m² Serum Creatinine level at diagnosis: _____umol/L / mg/dl

Height: _____(M) Date:_____(dd/mm/yyyy) Weight: _____(Kg) Date:_____(dd/mm/yyyy)

GFR /eGFR# at first dialysis: _____ml/min/1.73m² Serum Creatinine level at first dialysis: _____umol/L / mg/dl

Height: _____(M) Date:_____(dd/mm/yyyy) Weight: _____(Kg) Date:_____(dd/mm/yyyy)

4. CO-MORBID CONDITIONS

Smoking status: ☐Never ☐Ex-smoker ☐Current smoker ☐Missing

				Date of Diagnosis (ddmmyyy)
Diabetes Mellitus	☐Yes	☐No	☐Missing	
If Yes	☐Type I	☐Type II	☐Unspecified	_____
Hypertension	☐Yes	☐No	☐Missing	_____
Cerebrovascular disease	☐Yes	☐No	☐Missing	_____
Ischemic Heart Disease	☐Yes	☐No	☐Missing	_____
Peripheral Vascular Disease	☐Yes	☐No	☐Missing	_____
Malignancy	☐Yes	☐No	☐Missing	_____

If Yes, state diagnosis: _____

					Date of test (ddmmyyyy)
HepBs Ag	☐Positive	☐Negative	☐Equivocal	☐Missing	_____
Anti-HepBs Ab	☐≥10 IU/ml	☐<10 IU/ml		☐Missing	_____
Anti-HCV	☐Positive	☐Negative	☐Equivocal	☐Missing	_____
HCV-RNA	☐Positive	☐Negative	☐Not done	☐Missing	_____

- delete where applicable

5. CURRENT STATUS OF PATIENT

☐ Living ☐ Deceased	Date of Death: (ddmmyyyy) ☐☐☐☐☐☐☐☐
Place of Death: _____	Cause of death: _____

6. REHABILITATION STATUS AND QUALITY OF LIFE

Limitation/Preclusion from Transplant: _____ ☐☐☐

7. DETAILS OF NOTIFYING HEALTHCARE INSTITUTION

Name of Notifying Healthcare Institution (including department): _____

Name of Person who made the notification: _____

Date of Notification: _____ (dd/mm/yyyy)

*Mandatory data items

—— END OF REPORT ——

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March 2015