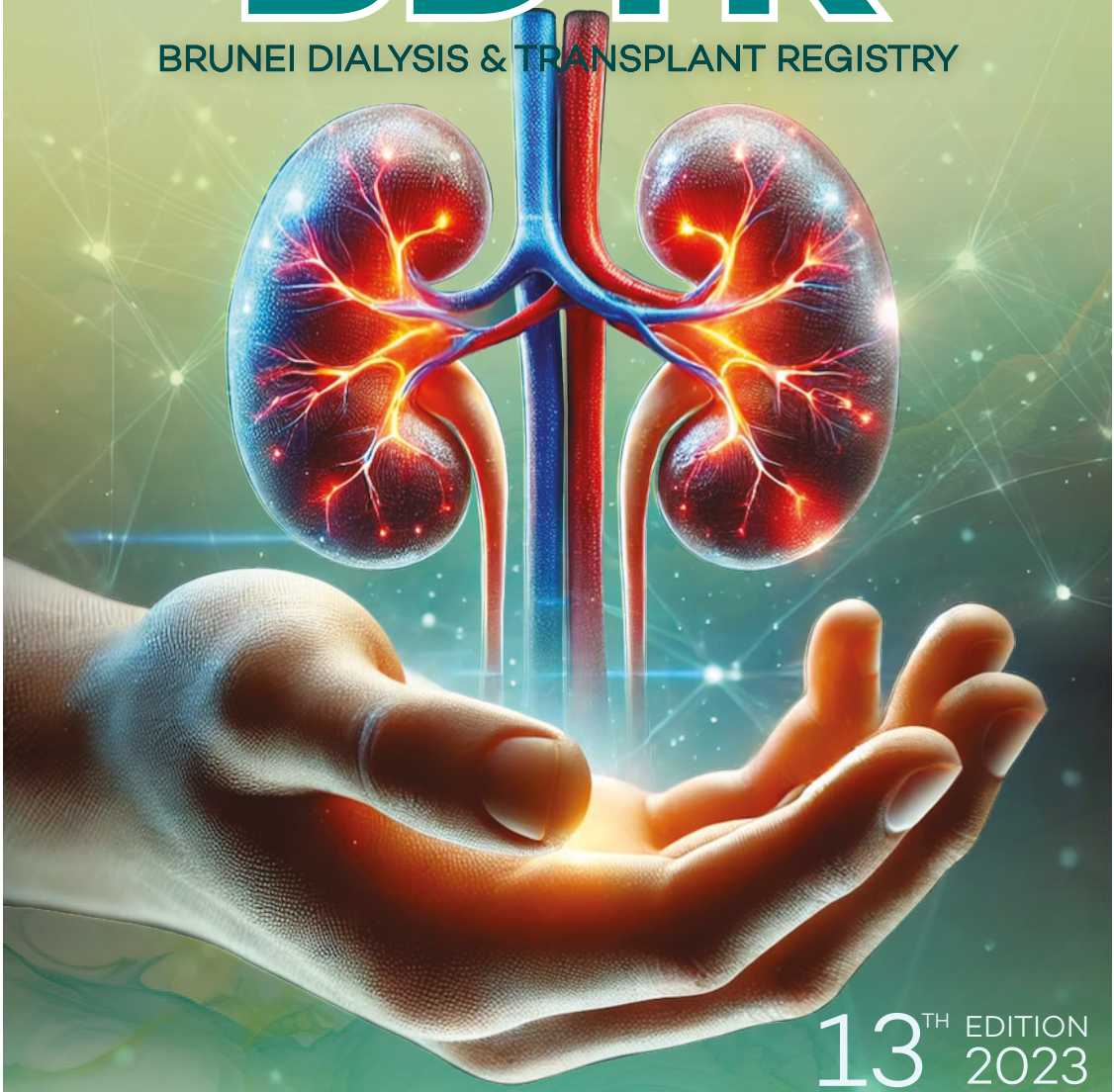
كمنترين كصيحتن
KEMENTERIAN KESIHATAN
MINISTRY OF HEALTH
NEGARA BRUNEI DARUSSALAM

BDTR

BRUNEI DIALYSIS & TRANSPLANT REGISTRY



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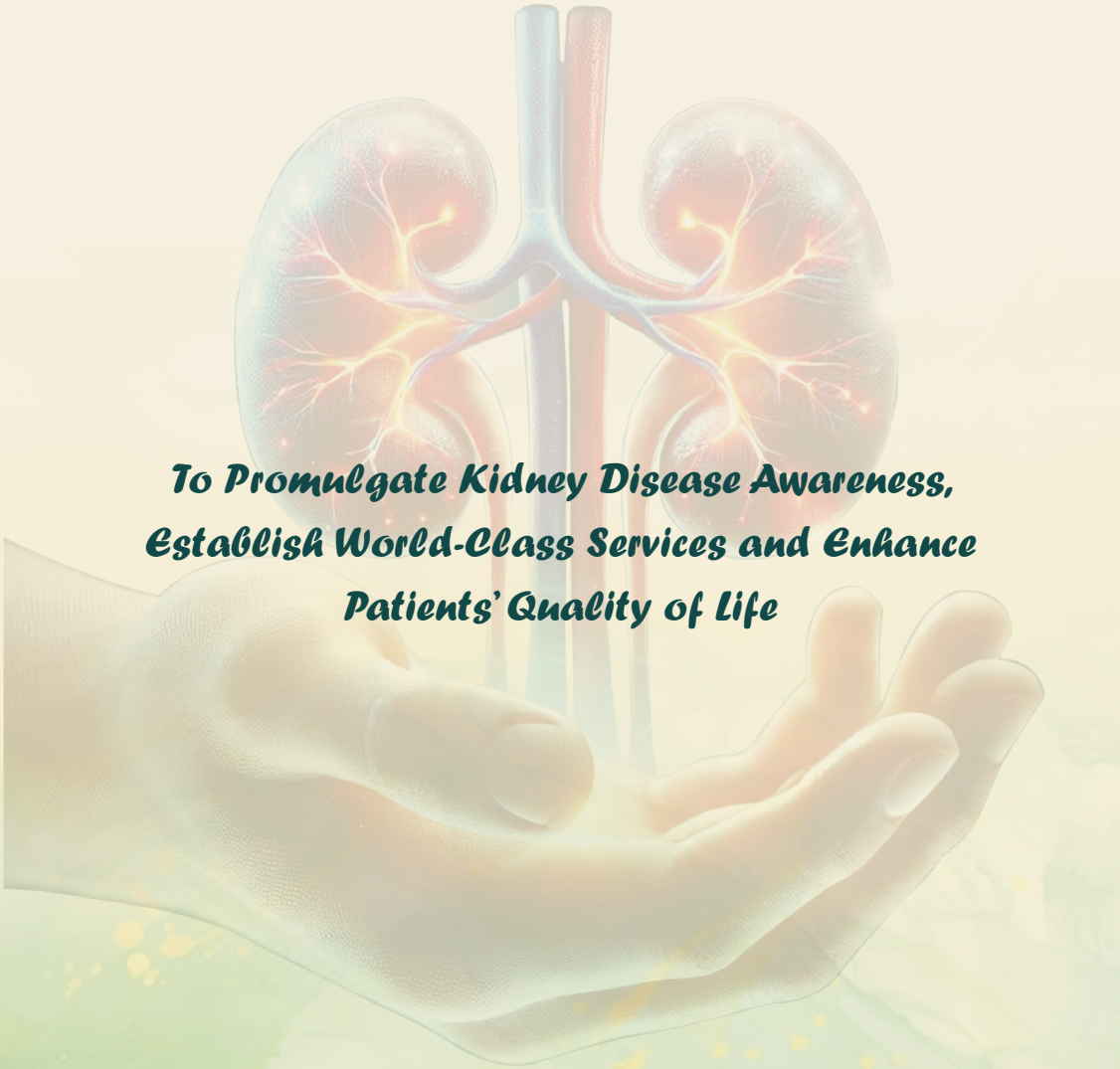

To Promulgate Kidney Disease Awareness, Establish World-Class Services and Enhance Patients' Quality of Life

Foreword

Dr Jackson Tan
Chief of Clinical Specialty Services (Renal)
Ministry of Health, Brunei Darussalam

The department is facing significant challenges related to End-Stage Kidney Failure (ESKF) in 2023, particularly due to the saturation of haemodialysis centres caused by a rising number of ESKF cases. To alleviate the pressure on haemodialysis services, there is an urgent need to expand alternatives such as peritoneal dialysis (PD) and kidney transplantation, which not only save costs but also improve the quality of life for patients.

Diabetes Mellitus (DM) is a major contributor to ESKF, accounting for nearly 80% of new cases in Brunei, making it the country with the highest percentage of DM-related ESKF globally. This starkly contrasts with developed nations, where DM accounts for less than 50% of ESKD cases.

To effectively manage the increasing burden of ESKF, strategic interventions are essential. These may include policy innovations like increased privatization to enhance efficiency and competition, as well as financial accountability measures for patients, such as out-of-pocket contributions and insurance support. Encouraging patients to prioritize PD or transplantation as first-choice therapies is also crucial. Additionally, intensifying public health awareness and patient education at the grassroots level and collaborative efforts with medical interdisciplinary teams can help address these challenges.

Despite a recent resurgence in peritoneal dialysis uptake, its growth has plateaued due to procedural complications and technical failures over the past year. Notwithstanding this, the country has managed to achieved a national PD penetration of 15%, which ranks amongst the best in South East Asia. However, the Ministry of Health needs to invest in staff training and incentivization to maintain skills and manage workloads effectively to maintain momentum of this progress. Improving community attitudes towards home-based treatments can further reduce reliance on institutional care. Transplantation is gaining acceptance in the community, with an increase in donors willing to donate to family members. Brunei has achieved a transplantation rate of 18 per million population in 2023, surpassing many other Asian nations. Future plans to enhance transplantation rates include promoting deceased donation, paired exchanges, and HLA/ABO incompatible transplants.

Project One has a mission to benchmark and compete against the best standards in South East Asia: Transplant incident rate of 20 per million population (pmp), peritoneal dialysis (PD) penetrance of 20% and haemodialysis (HD) arteriovenous fistula (AVF) prevalence of 85%. Whilst the targets have not been completely achieved in 2023, there are encouraging signs that progress has been made in peritoneal dialysis and transplantation. Ongoing efforts are necessary to address challenges and bolster community support for these treatment options in the coming year. An ethos of accountability must extend beyond healthcare providers to encompass the entire community.

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Chapter 1

Background

The Brunei Dialysis and Transplant Registry (BDTR) collates data from all the dialysis centres to improve the care of patients with kidney disease in the country. The BDTR enables an organized and standardized method to systematically collect observational data and can be used to describe the natural history, epidemiology and disease burden in the country. End Stage Kidney Failure (ESKF) and its associated morbidities result in substantial socio-economic burden to the country, which require meticulous planning of budget in order to provide the necessary healthcare resources. Most importantly, data from the BDTR can be used to benchmark the quality and standards of the services against those with established registries; allowing alignment with best practices from other countries.

The main motivation and impetus behind the establishment of a national registry remains unchanged since inception. The objectives are described below:

1. To describe the state of CKD in the country

2. To determine the disease burden attributable to ESKF

3. To determine factors influencing the outcomes of RRT

4. To evaluate the KRT program and benchmark against other practices

5. To stimulate and facilitate research on KRT and ESKF

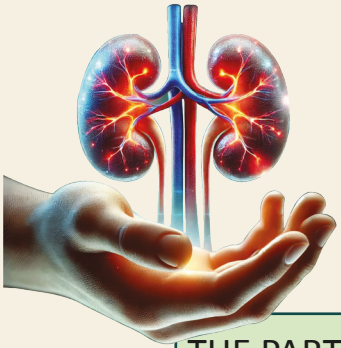
Chapter 2

Methodology and Population

2.1 Methodology

The research methodology is through primary data collection of a prospective multicentre cohort, designed to collect efficient and accurate information from ESKD patients undergoing treatment in participating dialysis centres and hospitals.

As in previous years, the format of collection remains the same with each dialysis centres contributing quarterly pre-determined blood parameters through their respective registry focal person, who will organize and validate the data for submission to the central registry office. Baseline demographic data of patients were usually established upon entry into KRT program by the admission team in the parent hospital. Future outcomes of patients including transfer to new centres, transfer to different modalities, deaths and loss to follow up were recorded and submitted on a monthly basis through pre-designed proformas to the registry office. In addition, information from the transplant and clinic cohorts are provided by the transplant and clinic coordinators at the same pre-determined times and stages.



THE PARTICIPATING CENTRES ARE AS FOLLOW:

1. Rimba Dialysis Centre,
Brunei-Muara District

2. Renal Dialysis Unit, Raja Isteri Pengiran Anak Seleha Hospital,
Brunei-Muara District

3. Kiarong Dialysis Centre,
Brunei-Muara District

4. JPMC Renal Dialysis Unit,
Brunei-Muara District

5. Kuala Belait Dialysis Centre,
Belait District

6. Tutong Dialysis Centre,
Tutong District

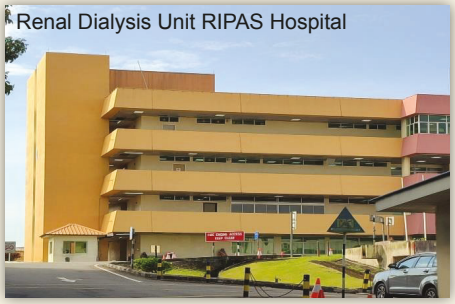
7. Temburong Dialysis Unit, Hospital PIHM Hospital,
Temburong District

8. Peritoneal Dialysis Unit, Rimba Dialysis Centre,
Brunei-Muara District

9. Renal Transplant Unit, Rimba Dialysis Centre,
Brunei-Muara District.

Facilities for Haemodialysis

Renal Dialysis Unit RIPAS Hospital



Rimba Dialysis Centre

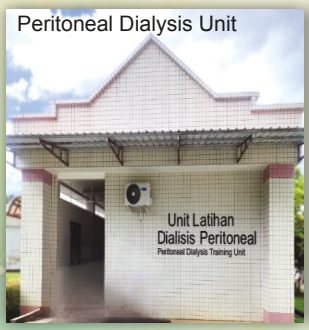
Kiarong Dialysis Centre

Kuala Belait Dialysis Centre

Tutong Dialysis Centre

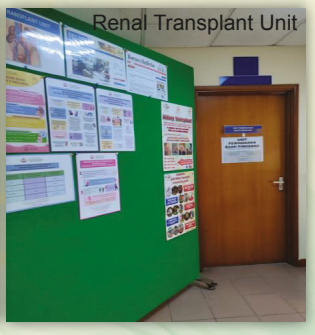
JPMC Renal Dialysis Centre

Peritoneal Dialysis Unit



Temburong Dialysis Unit

Renal Transplant Unit



2.2 ESKF Registry Population

Inclusion Criteria

The Registry population comprised of all ESKF patients treated at MOH facilities in Brunei Darussalam. This population covered all ESKF patients in Brunei as there was currently no other dialysis provider in the country. Non-Brunei citizens and residents who dialysed permanently in Brunei or had functioning transplant grafts under long term follow up in Brunei were also included in the registry.

Exclusion Criteria

A. Patients who underwent temporary acute haemodialysis (less than 2 weeks) are not included in the registry.

B. Patients who died within 2 weeks of starting KRT.

C. Foreign Nationals who had short-term (less than 4 weeks) KRT in Brunei.

D. Foreign Nationals who had short-term renal transplant follow up in Brunei.

E. Intensive Care patients who required slow low efficiency dialysis (SLED), continuous veno-venohaemofiltration (CVVHF), continuous veno-veno hemodiafiltration (CVVHDF) or single pass albumin dialysis (SPAD).

F. Patients who had KRT in private institutions (not applicable in this cohort).

Chapter 3

Incidence and Prevalence trends (2014 - 2023)

The treated point prevalence of ESKF on 31/12/2023 was 2244 per million population (pmp), which corresponded to 1012 prevalent patients. The treated annual incidence rate of ESKF was 574 pmp, which corresponded to 259 new patients. There was a 10.4% increase in absolute prevalent numbers (from 915 to 1018) in the past 12 months, representing the biggest increase in patient numbers since the inception of the registry. The incidence rate was also the highest recorded in the history of BDTR. To enable comparison with international registries and studies, ESKF patients who were dialysed for less than 3 months were not eligible to be included as incident patients.

In keeping with the national PD preference policy, there has been a progressive increment in peritoneal dialysis (PD) achieving a record penetrance of 14.8% (n=151) by the end of the registry period. HD and transplant accounted for 79.6% and 5.5% of the ESKF population respectively in 2023. The current PD penetrance ranked amongst the highest in the South East Asia.

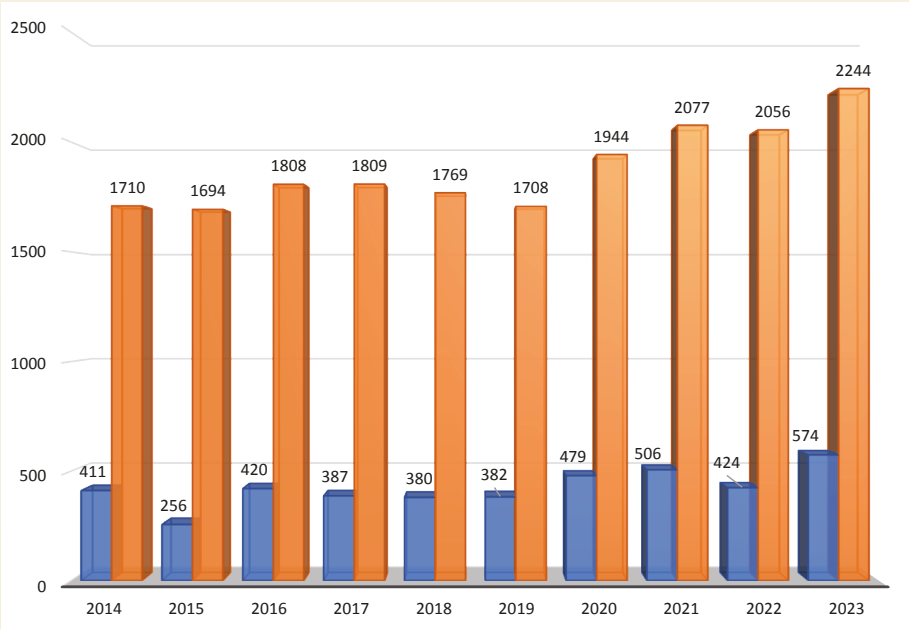
Table 1 - Total numbers of KRT patients (2014-2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
All	698	698	754	778	783	786	881	893	915	1018
HD	606	586	629	656	655	660	752	732	737	811
PD	53	67	78	75	82	80	81	114	125	151
TX	39	45	47	47	46	46	48	47	49	56

Table 2 - Prevalence (pmp) and incidence (pmp) trends over 10 years (2014-2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
KRT prevalent population	698	698	754	778	783	786	881	893	915	1012
KRT incident population	168	105	175	166	168	176	217	218	189	259
National population (1,000)	408	412	417	430	442	460	453	430	445	451
Prevalence ppm	1710	1694	1808	1809	1769	1708	1944	2077	2056	2244
Incidence ppm	411	256	420	387	380	382	479*	506*	424*	574*
Incidence to prevalence ratio	NA	NA	NA	NA	NA	NA	0.25	0.24	0.21	0.26

Figure 1 - Prevalence (pmp) and incidence (pmp) trends over 10 years (2014-2023)



Chapter 4

Incidence

A total of 259 patients fulfilled the registry criteria for commencing dialysis, for at least 2 weeks, in 2023. The mean and median age of dialysis start were 55.47 ± 12.43 and 55 years respectively, with a male preponderance (54%). 74% (n=191) of new patients were initiated with HD in RIPAS Hospital, with 16% in Suri Seri Begawan Hospital. 10% of patients were started directly on PD.

Diabetes Mellitus remained the most common cause of ESKF, accounting for up to 79% of all cases of incident patients. As most patients would not have had renal biopsies to confirm the exact renal pathology, the diagnosis of Diabetic Kidney Disease was based on clinical diagnosis. Glomerulonephritis (9%) and Hypertension (8%) were the second and third most common causes of kidney disease. Focal Segmental Glomerulosclerosis (FSGS) was the most common histological entity, with the majority of GN cases being unidentified glomerular disease (not biopsied). Whenever, there was a possibility of multiple pathological aetiologies, the most likely pathology was selected as the entry registry diagnosis.

Table 3 - Demographic details of incident patients

All		N (%)
Total		259
Mean Age (years)	55.47 ± 12.43	-
Median Age (years)	55	-
Genders	Male	139
	Female	120
Race	Malay	225
	Chinese	16
	Iban	11
	Dusun	4
	Foreigners	3
Hospital / Mobality start	RIPAS Hospital - HD	191
	Suri Seri Begawan Hospital - HD	42
	Peritoneal Dialysis	26

Table 4 - Aetiology of ESKF (2018-2023)

Incident		2023	2022	2021	2020	2019	2018
All		259	189	244	229	176	130
Diabetes Mellitus		204 (79%)	139 (74%)	177 (73%)	180 (79%)	134 (76%)	100 (77%)
Hypertension		20 (8%)	12 (6%)	22 (9%)	18 (8%)	16 (9%)	16 (12%)
Glomerulonephritis	All	24 (9%)	28 (15%)	29 (12%)	21 (9%)	14 (8%)	12 (9%)
	FSGS	5 (2%)	6 (3%)	3 (1%)	10 (4%)	4 (3%)	3 (2%)
	IgAN / HSN	1 (0%)	4 (2%)	4 (2%)	1 (0%)	1 (1%)	0
	MPGN	1 (0%)	2 (1%)	0	2 (1%)	0	0
	IgMN	0	0	0	0	1 (1%)	0
	MN	1 (0%)	1 (1%)	3 (1%)	0	0	1 (1%)
	Others	0	1 (1%)	1 (0%)	0 (0%)	1 (1%)	0
	Unspecified	16 (6%)	14 (7%)	18 (7%)	8 (3%)	7 (4%)	9 (7%)
Interstitial Nephritis		0	0	1 (0%)	0 (0%)	3 (2%)	0
Obstructive		4 (2%)	3 (2%)	4 (2%)	4 (2%)	2 (1%)	0
SLE		3 (1%)	2 (1%)	1 (0%)	2 (1%)	1 (1%)	0
APKD		1 (0%)	1 (1%)	1 (0%)	0	0	1 (1%)
Others		3 (1%)	3 (2%)	1 (0%)	2 (1%)	4 (3%)	0
Unknown		0	0	3 (1%)	2 (1%)	2 (1%)	1 (1%)

Chapter 5

Demographics of prevalent ESKF patients

HD remained the most dominant KRT modality in 2023 with 811 prevalent patients, with 34% of patients in Rimba Dialysis Centre. The acute hospitals, RIPAS hospital and Suri Seri Begawan hospital, accounted for 17% and 15% of all chronic HD patients.

The mean age of HD and PD patients were 55.23 ± 12.63 and 49.71 ± 14.51 years. The mean dialysis vintage of HD and PD patients were 3.49 ± 4.79 and 2.48 ± 3.57 years respectively. However, due to data input irregularities, the calculated values for dialysis vintage were underestimated as the mean years were usually rounded down to nearest number (example - 0 year, 7 months will be rounded down to 0 year).

Table 5 - Distribution of patients by dialysis Centres and KRT modalities

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rimba Dialysis Centre	240	246	244	263	290	294	292	298	279	265	277
Kiarong Dialysis Centre	64	60	60	60	58	57	60	64	65	60	59
Renal Dialysis Unit RIPASH	105	134	112	131	130	119	121	165	119	100	140
JPMC Renal Dialysis Unit	NA	NA	NA	NA	NA	NA	NA	NA	45	88	93
Tutong Dialysis Centre	38	51	60	61	63	62	60	77	76	76	87
Kuala Belait Dialysis Centre	93	85	83	93	93	98	104	112	121	120	125
Temburong Dialysis Unit	30	30	27	21	22	25	23	36	27	28	30
HD	570	606	586	629	656	655	660	752	732	737	811
PD	46	53	67	78	75	82	80	81	114	125	151
Tx	36	39	45	47	47	46	46	48	47	49	56
All	652	698	698	754	778	783	786	881	893	915	1018

Legend: HD - Haemodialysis PD - Peritoneal Dialysis TX - Transplant

Table 6 - Age groups of ESKF patients

Dialysis Centre	N	% data recorded	Mean age	Standard deviation	Median age	% 0-19	% 20-44	% 45-64	% 65-74	% 75+
Rimba Dialysis Centre	277	92	55.54	12.16	56	0	19	57	20	4
Kiarong Dialysis Centre	59	95	51.32	10.51	51	0	27	61	13	0
Renal Dialysis Unit RIPASH	140	99	56.67	12.63	57	0	17	56	20	7
JPMC Renal Dialysis Unit	93	98	53.41	13.35	54	0	21	58	15	5
Tutong Dialysis Centre	87	99	55.05	14.83	58	0	24	44	24	7
Kuala Belait Dialysis Centre	125	100	55.65	12.20	54	0	14	60	19	6
Temburong Dialysis Unit	30	90	57.85	11.99	59	0	15	48	37	0
HD	811	96	55.23	12.63	56	0	19	56	20	5
PD	151	99	49.71	14.51	49	1	37	45	14	3
All dialysis	962	97	54.34	13.11	55	0	22	54	19	5

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 7 - Dialysis vintage of ESKF patients

Dialysis Centre	N	% data recorded	Mean years	Standard deviation	Median years	% < 1 year	% 1-5 years	% 6-10 years	% 11-20 years	% > 20 years
Rimba Dialysis Centre	277	90	4.51	5.21	3	13	59	19	6	2
Kiarong Dialysis Centre	59	95	5.11	6.48	3	7	71	7	7	7
Renal Dialysis Unit RIPASH	140	100	1.15	2.31	0	66	26	6	1	0
JPMC Renal Dialysis Unit	93	98	2.01	2.21	2	30	65	8	1	0
Tutong Dialysis Centre	87	98	5.33	5.99	3	12	53	21	11	4
Kuala Belait Dialysis Centre	125	98	3.11	4.41	2	24	63	6	6	2
Temburong Dialysis Unit	30	90	3.89	3.87	3	15	59	19	7	0
HD	811	95	3.49	4.79	2	25	55	13	5	2
PD	151	100	2.48	3.57	1	29	56	12	3	0
All Dialysis	962	96	3.33	4.63	2	26	55	13	5	2

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

* Years are underestimated, as the mean years are usually rounded down to nearest number (example- 0 year, 7 months will be rounded down to 0 year)

Table 8 - Overall demographics of prevalent patients

All		N (%)
		803
Mean Age (Years)	54.23 + 13.22	-
Median Age (Years)	54	
Gender	Male	398
	Female	405
Race	Malay	705
	Chinese	48
	Iban	30
	Dusun	12
	Foreigners	8

Chapter 6

Mortality

There were 154 deaths in 2023. The mean and median age of deaths were 60.77 ± 12.78 and 61 years respectively. The most common causes of deaths were sepsis (29%), cardiac (13%) and CVA (6%). No specific cause of death was recorded in 43% of deaths.

The overall annual death rate of the KRT cohort was 14%. HD patients had a death rate of 15%, whilst PD death rate was 11%. HD death rates were highest amongst patients in RIPASH and Suri Seri Begawan Hospital (19%). However, death rates had to be evaluated with caution as patients change dialysis centres and modalities which affected the interpretation of results. Furthermore, hospital-based dialysis centres also had more unstable and unwell patients than peripheral satellite centres, which have been consistently reflected by higher death rates in these centres over the years.

Table 9 - Demographic of patients who died in 2023

		Total
All		154
Mean Age (years)		60.77 + 12.78
Median Age (years)		61
Gender	Male	83
	Female	76
Mean duration of kidney failure (years)		3.59 + 3.90
Median duration of kidney failure (years)		3
Cause of deaths	Sepsis	44
	Cardiovascular	20
	Cerebrovascular	10
	Others	4
	Not specified	76
Race	Malay	141
	Chinese	12
	Others	6

Table 10 - Ten-year trend of total number of deaths in dialysis modalities from 2014 - 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rimba Dialysis Centre	32	37	30	52	56	60	44	63	60	41
Kiarong Dialysis Centre	5	4	2	5	9	10	5	23	12	10
Renal Dialysis Unit RIPASH	47	76	41	36	48	37	38	62	46	32
JPMC Renal Dialysis Unit	NA	NA	NA	NA	NA	NA	NA	10	7	12
Tutong Dialysis Centre	2	7	9	12	10	10	13	20	12	13
Kuala Belait Dialysis Centre	26	21	21	29	23	30	28	30	29	30
Temburong Dialysis Unit	6	9	6	4	3	5	2	13	3	5
HD	118	154	109	138	149	152	131	221	169	143
PD	4	3	13	12	9	11	7	13	23	19
Tx	0	1	0	1	1	2	1	1	0	0
All	122	158	122	151	159	165	138	235	192	162

Legend: HD - Haemodialysis PD - Peritoneal Dialysis TX - Transplant

Table 11 - Mortality percentage of all centres and modalities from 2014 - 2023 (number of deaths in centre / total number of patients + number of deaths in centre)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rimba Dialysis Centre	12	13	10	15	16	17	13	18	18	13
Kiarong Dialysis Centre	8	6	3	8	14	14	7	26	17	14
Renal Dialysis Unit RIPASH	26	64	24	22	29	23	19	34	32	19
JPMC Renal Dialysis Unit	-	-	-	-	-	-	-	18	7	11
Tutong Dialysis Centre	4	10	13	16	14	14	14	21	14	13
Kuala Belait Dialysis Centre	23	20	18	24	19	22	20	20	19	19
Temburong Dialysis Unit	17	25	22	15	11	18	5	33	10	14
HD	16	21	15	17	19	19	15	23	19	15
PD	7	4	14	14	10	12	8	10	16	11
Tx	0	2	0	2	2	4	2	2	0	0
All	15	18	14	16	17	17	14	21	17	14

Legend: HD - Haemodialysis PD - Peritoneal Dialysis TX - Transplant

Figure 2 - Death rates comparison between KRT modalities (2014 - 2023)

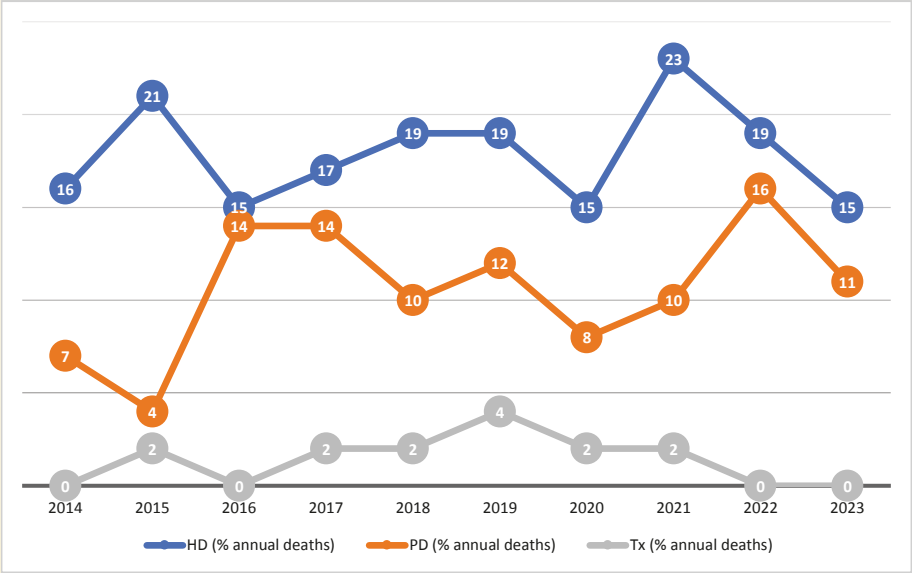


Figure 3 - Mortality percentage of all centres and modalities from 2014 - 2023 (number of deaths in centre / total number of patients + number of deaths in centre)

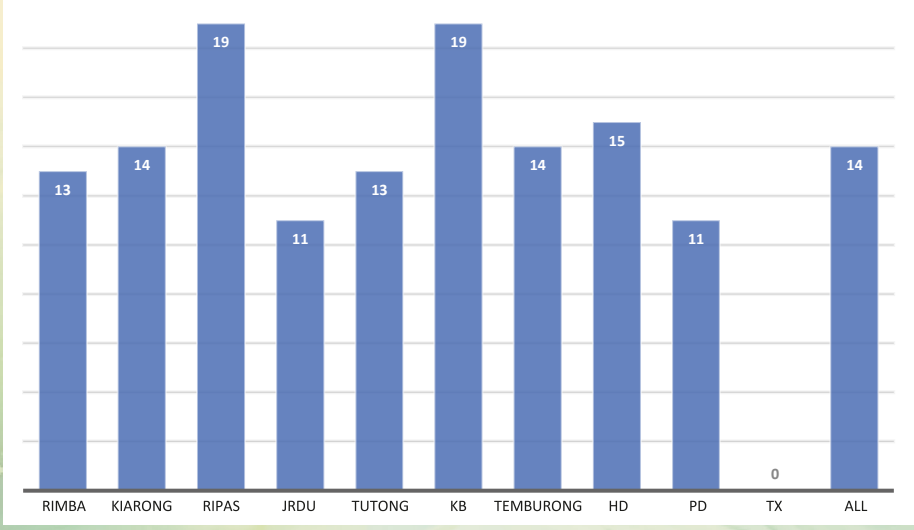


Figure 4 - Deaths (n) and incidence (n) trends over 10 years (2014 - 2023)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Deaths	122	158	122	151	159	165	138	235	192	162
Incident cases	168	105	175	166	168	176	217	218	189	259

Chapter 7

Anaemia

The mean haemoglobin level amongst HD and PD patients was 11.07 ± 1.90 g/dl, consistent with trends over the last 10 years, with 54% of patients within the recommended KDIGO Clinical Practice Guideline target level of 10.0 to 12.9 g/dl. HD patients had a slightly higher mean Hb levels compared to PD patients (11.11 vs 10.88 g/dl), likely through the greater and more consistent use of erythropoietin and intravenous iron therapy amongst the HD population.

Table 12 - Haemoglobin levels in ESKF patients (by centres and KRT modalities)

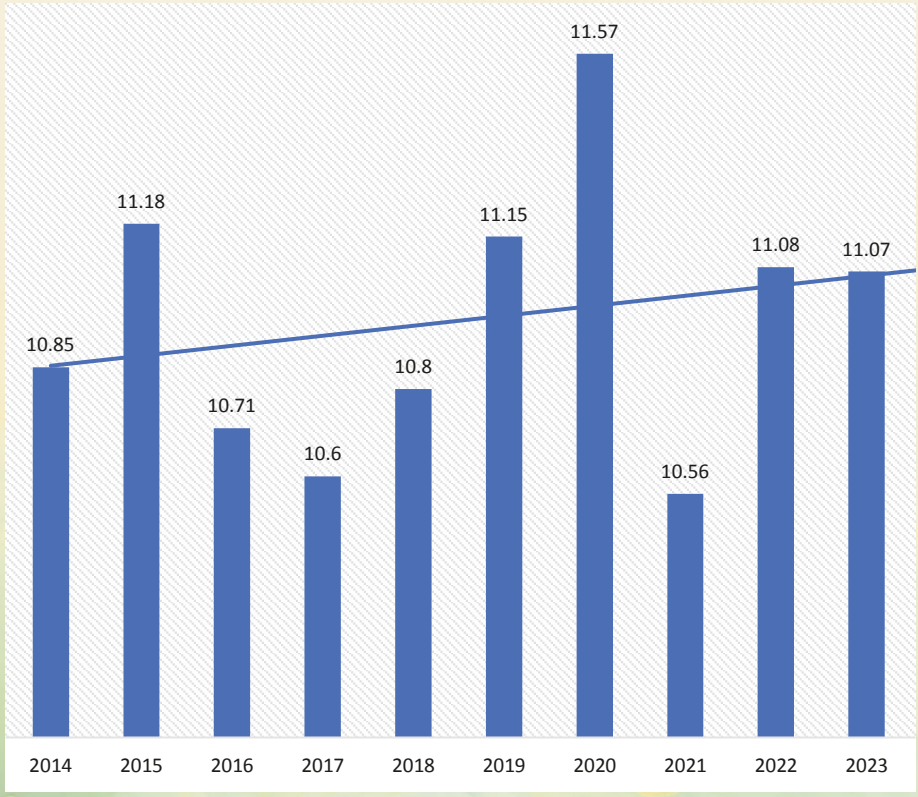
Dialysis Centre	N	% data recorded	Mean (g/dl)	SD	Median (g/dl)	Under 10g/dl (%)	10.1 - 12.9 g/dl (%)	Over 13 (g/dl)
Rimba Dialysis Centre	277	89	11.22	1.84	11.40	25	59	17
Kiarong Dialysis Centre	59	95	11.40	1.58	11.40	20	63	17
Renal Dialysis Unit RIPASH	140	97	9.61	1.61	9.50	64	32	2
JPMC Renal Dialysis Unit	93	94	12.10	0.71	12.0	18	51	31
Tutong Dialysis Centre	87	99	11.50	1.21	11.50	13	74	13
Kuala Belait Dialysis Centre	125	98	11.34	1.79	11.30	25	56	19
Temburong Dialysis Unit	30	90	11.52	1.07	11.30	30	48	22
HD	811	94	11.11	1.92	11.10	30	54	16
PD	151	100	10.88	1.00	10.80	35	52	13
All	962	95	11.07	1.90	11.10	30	54	16

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 13 - Haemoglobin levels in ESKF patients (2014 - 2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean Hb	10.85	11.18	10.71	10.60	10.80	11.15	11.57	10.56	11.08	11.07
& in target range	-	-	-	-	-	-	57	56	58	54

Figure 5 - Trends of Haemoglobin levels in ESKF patients (2014 - 2023)



Chapter 8

Mineral Bone Diseases

The mean and median phosphate levels of HD and PD patients were 1.84 ± 0.61 mmol/l and 1.76 mmol/l respectively in 2023. 45% of HD and 40% of PD patients achieved the desired range of 1.13 to 1.78 mmol/l (KDOQI guideline). Compared to HD patients, PD patients recorded significantly higher phosphate levels. There was an encouraging trend towards better phosphate levels over the past decade.

Parathyroid hormone levels remained poor with mean and median values of 72.75 ± 67.91 pmol/l and 53 pmol/l respectively. Only 15% of all patients were able to achieve KDOQI guideline level of 16.5-33 pmol/l. Only 7 patients had parathyroidectomy operations in 2023. The mean and median calcium level of HD and PD patients were 2.18 ± 0.23 mmol/l and 2.20 mmol/l respectively. 50% and 48% of HD and PD patients respectively were able to achieve KDOQI target levels of 2.1-2.37 mmol/l.

Table 14 - Phosphate levels in ESKF patients (by centres and KRT modalities)

Dialysis Centre	N	% data recorded	Mean (mmol/l)	SD	Median (mmol/l)	% Between 1.13 to 1.78 mmol/l
Rimba Dialysis Centre	277	88	1.81	0.58	1.69	47
Kiarong Dialysis Centre	59	95	1.93	0.55	1.77	46
Renal Dialysis Unit RIPASH	140	94	1.76	0.68	1.73	41
JPMC Renal Dialysis Unit	93	91	1.96	0.35	1.94	38
Tutong Dialysis Centre	87	99	1.79	0.64	1.73	38
Kuala Belait Dialysis Centre	125	93	1.78	0.56	1.76	42
Temburong Dialysis Unit	30	90	1.65	0.22	1.47	41
HD	811	92	1.81	0.61	1.73	45
PD	151	100	1.98	0.62	1.87	40
All Dialysis	962	93	1.84	0.61	1.76	44

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Figure 6 - Trends of phosphate levels in ESKF patients (2014 - 2023)

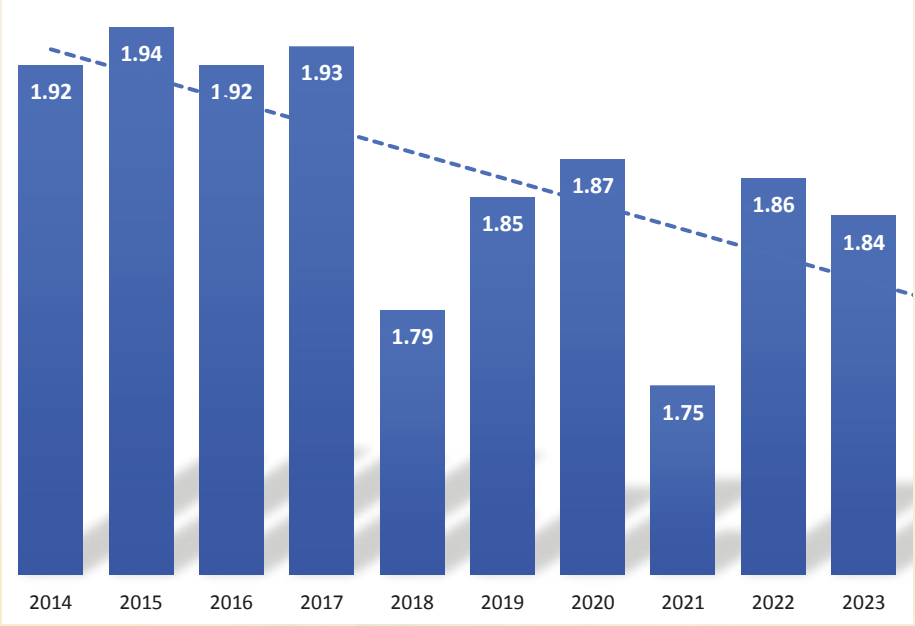


Table 15 - Phosphate levels in ESKF patients (2014 - 2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean Ph	1.92	1.94	1.92	1.93	1.79	1.85	1.87	1.75	1.86	1.84
% in target range	-	-	-	-	-	-	39	39	40	44

Table 16 - PTH levels in ESKF patients (by centres and KRT modalities)

Dialysis Centre	N	% data recorded	Mean (pmol/L)	SD	Median (pmol/L)	% Between 16.5 to 33 pmol/L
Rimba Dialysis Centre	277	87	73.67	68.60	53.9	14
Kiarong Dialysis Centre	59	93	72.96	51.88	52.7	15
Renal Dialysis Unit RIPASH	140	76	65.82	66.39	46.5	21
JPMC Renal Dialysis Unit	93	92	85.00	76.14	54.5	20
Tutong Dialysis Centre	87	98	72.67	62.70	51.5	18
Kuala Belait Dialysis Centre	125	89	81.70	91.50	56.9	12
Temburong Dialysis Unit	30	90	64.01	53.39	52.6	19
HD	811	88	74.47	71.03	53.0	15
PD	151	99	64.61	50.00	55.2	15
All Dialysis	962	93	72.75	67.91	53.3	15

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 17 - PTH levels in ESKF patients (2014 - 2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Median PTH	50	47	52	50	40	39	43	59	50	53
% in target range	-	-	-	-	-	-	21	26	15	15

Figure 7 - Trends of PTH levels in ESKF patients (2014 - 2023)

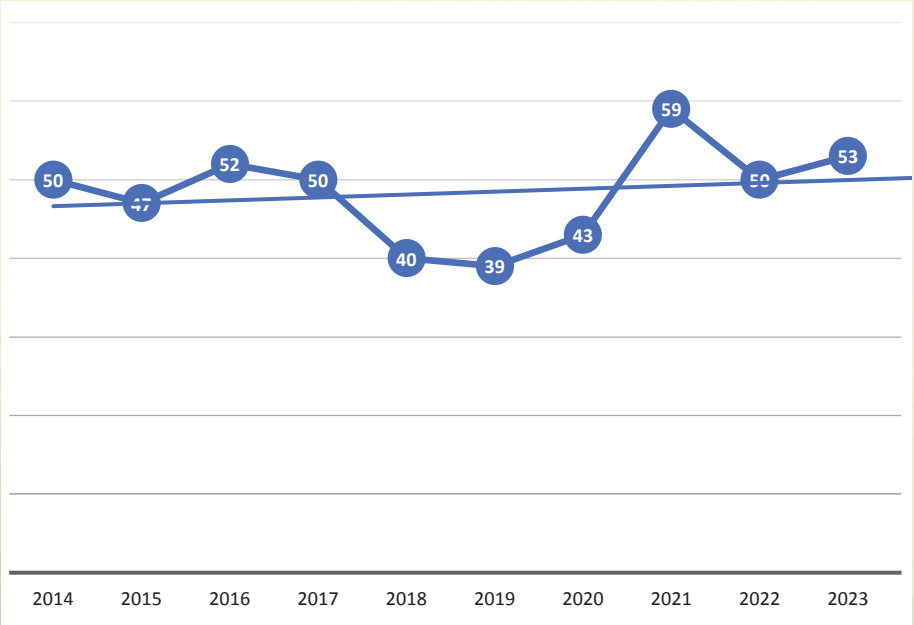


Figure 8 - Parathyroidectomy operations performed from 2018 - 2023

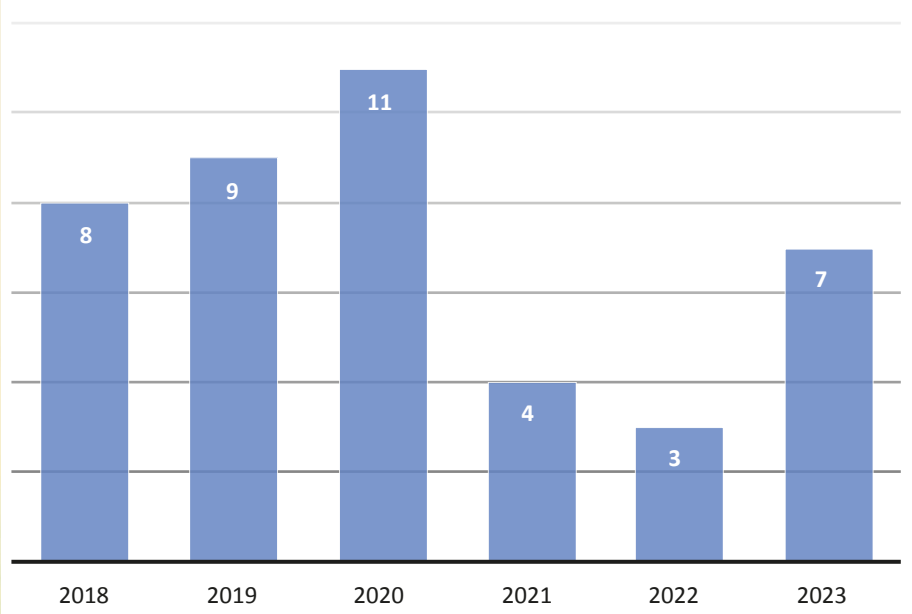


Table 18 - Calcium levels in ESKF patients (by centres and KRT modalities)

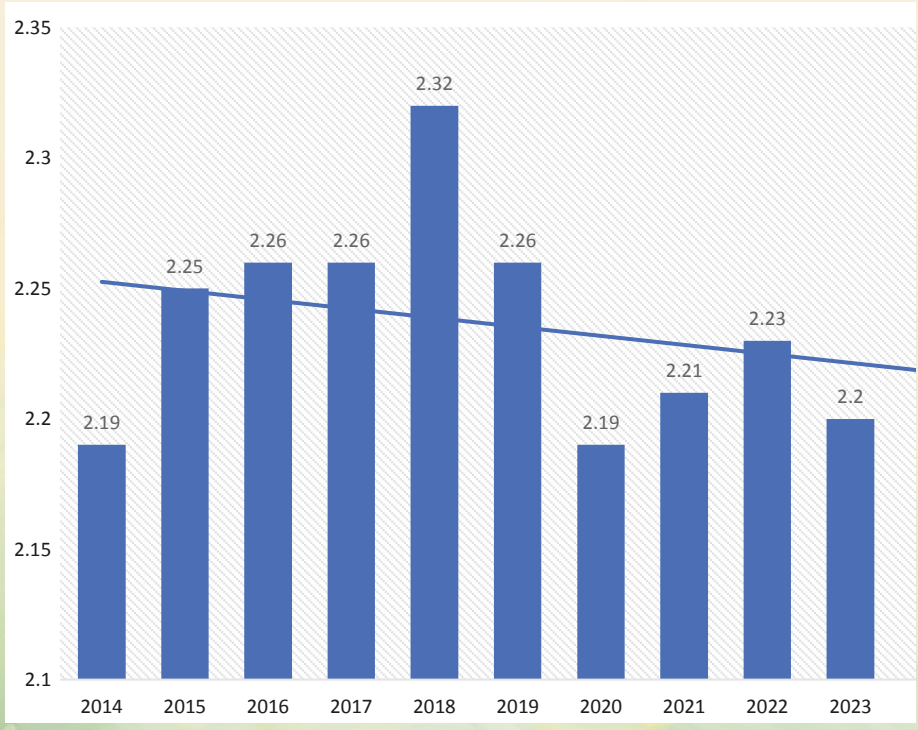
Dialysis Centre	N	% data recorded	Mean (mmol/l)	SD	Median (mmol/l)	% Between 2.1 to 2.37*
Rimba Dialysis Centre	277	85	2.19	0.25	2.20	50
Kiarong Dialysis Centre	59	93	2.16	0.19	2.15	53
Renal Dialysis Unit RIPASH	140	74	2.15	0.21	2.15	52
JPMC Renal Dialysis Unit	93	86	2.08	0.19	2.09	44
Tutong Dialysis Centre	87	99	2.17	0.28	2.20	44
Kuala Belait Dialysis Centre	125	94	2.21	0.21	2.22	58
Temburong Dialysis Unit	30	90	2.08	0.19	2.07	41
HD	811	87	2.17	0.23	2.18	50
PD	151	94	2.27	0.25	2.26	48
All Dialysis	962	88	2.18	0.23	2.20	50

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 19 - Calcium levels in ESKF patients (2014 - 2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean Ca	2.19	2.25	2.26	2.26	2.32	2.26	2.19	2.21	2.23	2.20
% in target range	-	-	-	-	-	-	49	47	55	50

Figure 9 - Trends of calcium levels in ESKF patients (2014 - 2023)



Chapter 9

Dialysis Adequacy, HD Blood Flow and HD AVF rate

50% and 54% of HD and PD patients respectively achieved target adequacy (URR of 0.7 for HD and Kt/V of > 1.7 for PD) in 2023. The mean and median URR for HD patients were 0.66 ± 0.11 and 0.68 respectively. The mean and median kt/V for PD patients were 1.71 ± 0.39 and 1.70 respectively. Mean and median blood flow for HD patients was 272 ± 29 and 270 mls/min. 35% of HD patients had blood flow of 300mls/min or greater. The current national AVF rate for HD patients was 64% in 2023, which has progressively improved since the COVID-19 period.

Table 20 - Mean blood flow in HD centres (2014 - 2023)

Dialysis Centre	N	% data recorded	Mean (ml/min)	SD	Median (ml/min)	≥ 300mls/min (%)
Rimba Dialysis Centre	277	84	278	28	280	38
Kiarong Dialysis Centre	59	93	290	34	280	42
Renal Dialysis Unit RIPASH	140	91	256	25	250	12
JPMC Renal Dialysis Unit	93	78	288	20	300	71
Tutong Dialysis Centre	87	99	277	29	270	22
Kuala Belait Dialysis Centre	125	94	255	19	250	7
Temburong Dialysis Unit	30	90	271	33	260	41
HD	811	87	272	29	270	35

Table 21 - Trends of mean blood flow in HD centres (2014 - 2023)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean blood flow rate (HD)	259	246	253	248	255	280	278	282	273	272

Figure 10 - Mean blood flow of HD patients (2014 - 2023)

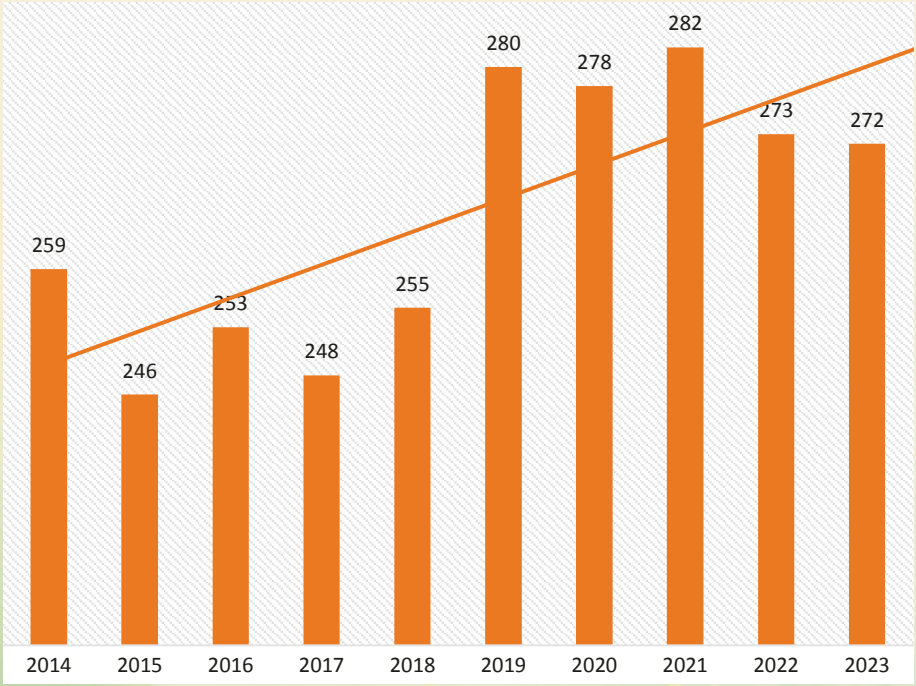


Table 22 - Mean URR (HD) / Kt/V (PD) from 2014 - 2023

Dialysis Centre	No.	% data recorded	Mean URR (HD) or Kt/V (PD)	SD	Median URR (HD) or Kt/V (PD)	% With URR > 0.7 (HD) or Kt/V > 1.7 (PD)
Rimba Dialysis Centre	277	73	0.68	0.10	0.69	50
Kiarong Dialysis Centre	59	95	0.66	0.09	0.65	34
Renal Dialysis Unit RIPASH	140	62	0.64	0.11	0.65	30
JPMC Renal Dialysis Unit	93	74	0.70	0.10	0.70	55
Tutong Dialysis Centre	87	99	0.69	0.09	0.70	50
Kuala Belait Dialysis Centre	125	77	0.60	0.14	0.65	28
Temburong Dialysis Unit	30	90	0.67	0.09	0.67	48
HD	811	77	0.66	0.11	0.68	50
PD (kt/v)	151	100	1.71	0.39	1.70	54

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 23 - URR (HD) trends from 2014 - 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean URR (HD)	0.70	0.67	0.67	0.60	0.66	0.64	0.66	0.64	0.68	0.66

Table 24 - Kt/V (PD) trends from 2014 - 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean kt/v (PD)	1.89	1.86	1.84	1.79	1.77	1.75	1.74	1.74	1.73	1.71

Figure 11 - Mean URR (HD) from 2014 - 2023

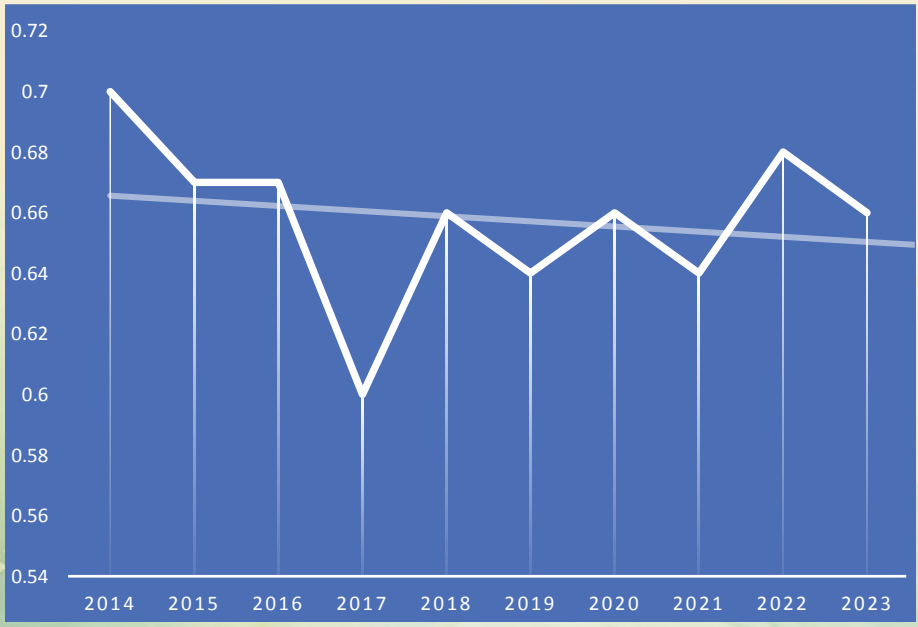


Figure 12 - Mean Kt/V of PD patients from 2014 to 2023

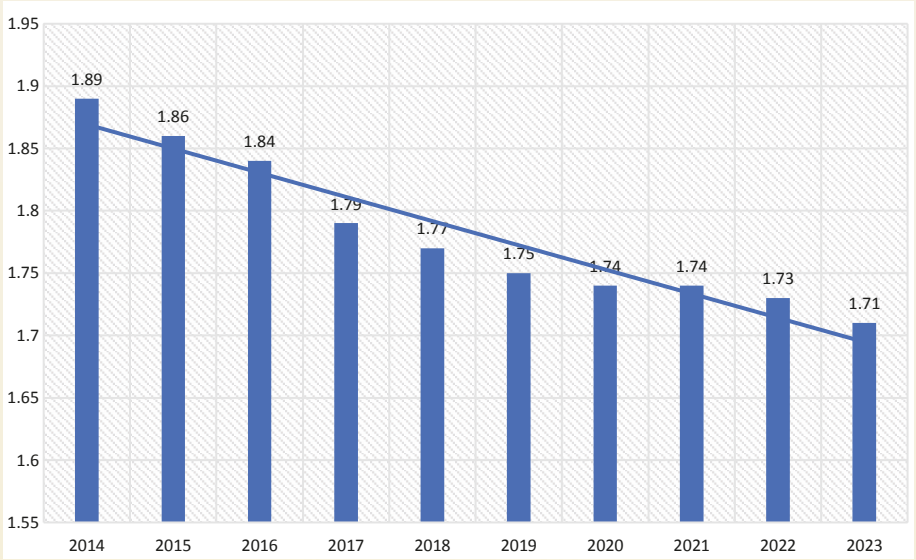


Table 25 - Trends and distribution of HD patients with AVF (2019 - 2023)

Dialysis Centre	Number of HD patients	% data recorded	No. of HD patients with functioning AVF	AVF (%) 2023	AVF (%) 2022	AVF (%) 2021	AVF (%) 2020	AVF (%) 2019
Rimba Dialysis Centre	277	82	192	81	76	75	84	83
Kiarong Dialysis Centre	59	93	46	83	77	75	83	86
Renal Dialysis Unit RIPASH	140	95	40	30	36	37	47	53
JPMC Renal Dialysis Unit	93	95	53	60	22	NA	NA	NA
Tutong Dialysis Centre	87	99	65	76	79	71	74	86
Kuala Belait Dialysis Centre	125	97	63	52	42	39	45	52
Temburong Dialysis Unit	30	90	20	74	58	62	72	83
HD	811	91	479	64	56	59	70	81

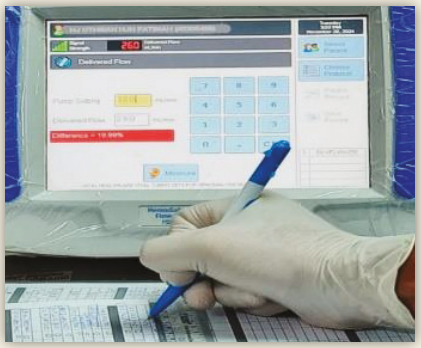
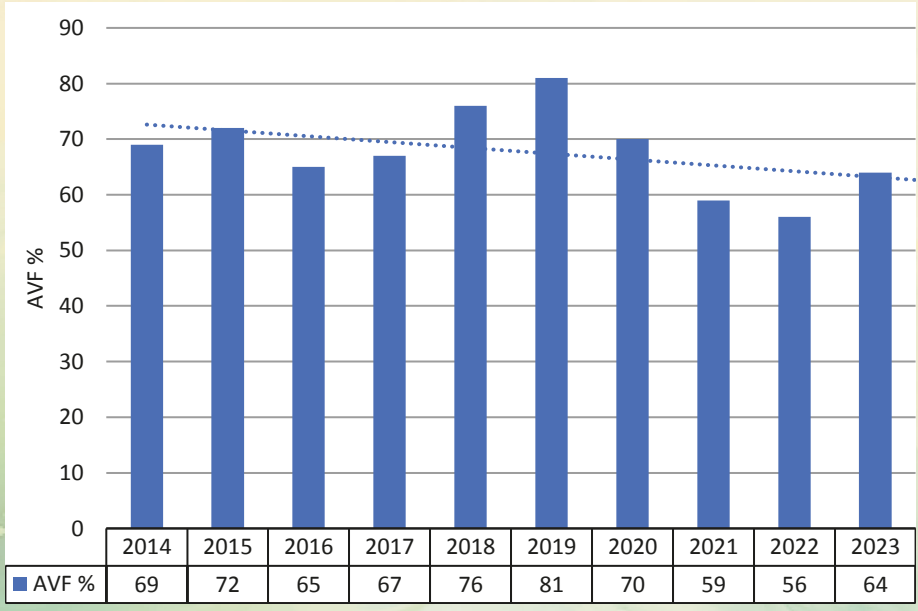


Table 26 - Trends of AVF prevalence from 2014 - 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AVF prevalence (%)	69	72	65	67	76	81	70	59	56	64

Figure 13 - Trends of AVF prevalence from 2014 - 2023



Chapter 10

Systolic and diastolic blood pressure (SBP and DBP)

The mean and median systolic blood pressure for HD and PD patients were 138.81 ± 18.93 mm Hg and 140 mm Hg respectively. PD patients had lower SBP than HD patients (137 mm Hg vs 139 mm Hg). The mean and median diastolic blood pressure were 77.09 ± 10.0 and 80 mm Hg. HD patients had lower DBP than PD patients (77 mm Hg vs 79 mm Hg).

Table 27 - Mean SBP in ESKF patients (by centres and KRT modalities)

Dialysis Centre	Number of HD patients	% data recorded	Mean SBP	SD	Median SBP
Rimba Dialysis Centre	277	89	135.99	17.57	132
Kiarong Dialysis Centre	59	93	132.20	11.95	130
Renal Dialysis Unit RIPASH	140	96	148.69	19.87	150
JPMC Renal Dialysis Unit	93	96	134.17	20.62	132
Tutong Dialysis Centre	87	99	136.40	12.64	140
Kuala Belait Dialysis Centre	125	99	142.41	12.25	141
Temburong Dialysis Unit	30	90	145.81	12.51	140
HD	811	94	139.19	18.84	140
PD	151	99	136.93	19.34	138
All	962	95	138.81	18.93	140

Table 28 - Mean DBP in ESKF patients (by centres and KRT modalities)

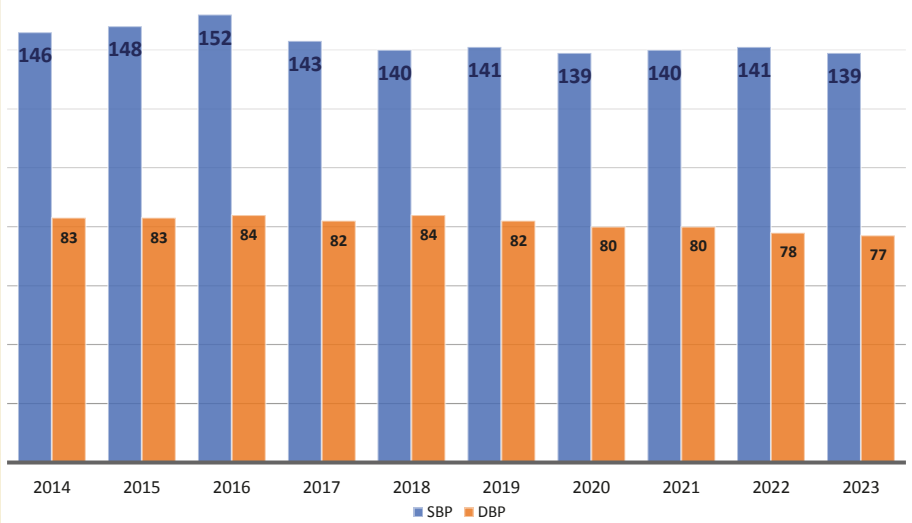
Dialysis Centre	Number of HD patients	% data recorded	Mean DBP	SD	Median DBP
Rimba Dialysis Centre	277	86	77.79	6.88	80
Kiarong Dialysis Centre	59	93	72.36	6.37	70
Renal Dialysis Unit RIPASH	140	97	78.14	9.76	80
JPMC Renal Dialysis Unit	93	96	69.01	12.64	68
Tutong Dialysis Centre	87	99	78.83	5.61	80
Kuala Belait Dialysis Centre	125	98	77.89	11.31	78
Temburong Dialysis Unit	30	90	76.67	9.43	80
HD	811	93	79.26	12.05	80
PD	151	100	77.09	9.96	80
All	962	94	138.81	18.93	80

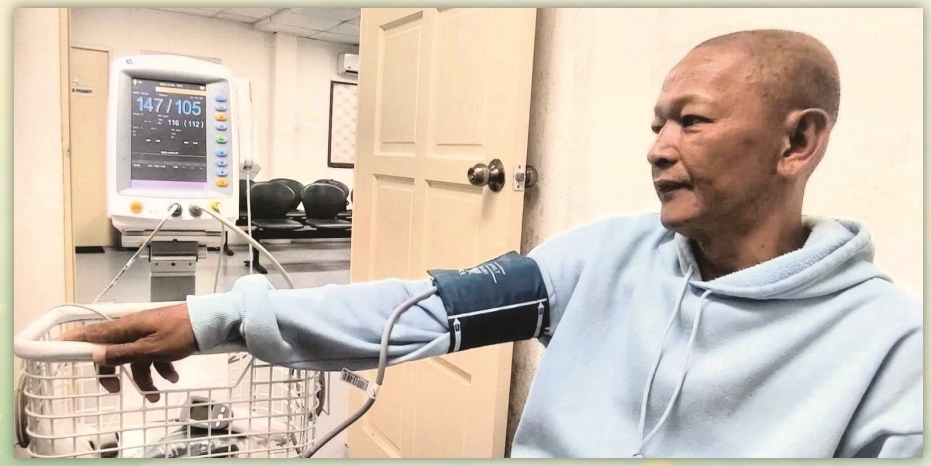
Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 29 - Mean SBP and DBP trends from 2014 - 2023

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Mean SBP	146	148	152	143	140	141	139	140	141	139
Mean DBP	83	83	84	82	84	82	80	80	78	77

Figure 14 - Mean SBP and DBP trends from 2014 - 2023





Chapter 11

Hepatitis B and C

There was a progressive decline in HD patients with Hepatitis C over the decade, from 18 patients in 2014 to 7 patients in 2023. This corresponded with a prevalence drop of 2.97% (2014) to 0.86% (2023), likely through the advent of curative Hepatitis C regimens (Direct Acting Antiviral drugs). However, the Hepatitis B prevalence has remained similar over the decade with 19 patients (3.14%) in 2014 to 17 patients (2.09%) in 2023.

Table 30 - Hepatitis B tends from 2014 - 2023

Dialysis Centre	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rimba Dialysis Centre	8	7	13	8	8	5	7	8	6	8
Kiarong Dialysis Centre	0	1	0	0	4	0	0	0	0	0
Renal Dialysis Unit RIPASH	3	2	7	1	4	2	2	2	1	2
JPMC Renal Dialysis Unit	-	-	-	-	-	-	-	0	0	0
Tutong Dialysis Centre	1	0	0	0	0	0	1	2	2	1
Kuala Belait Dialysis Centre	2	2	2	1	2	3	4	3	3	4
Temburong Dialysis Unit	2	0	0	0	0	0	0	1	3	2
HD	16	12	22	10	18	10	14	16	15	17
PD	3	1	2	1	1	0	0	1	1	0
All	19	13	24	11	19	10	14	17	16	17

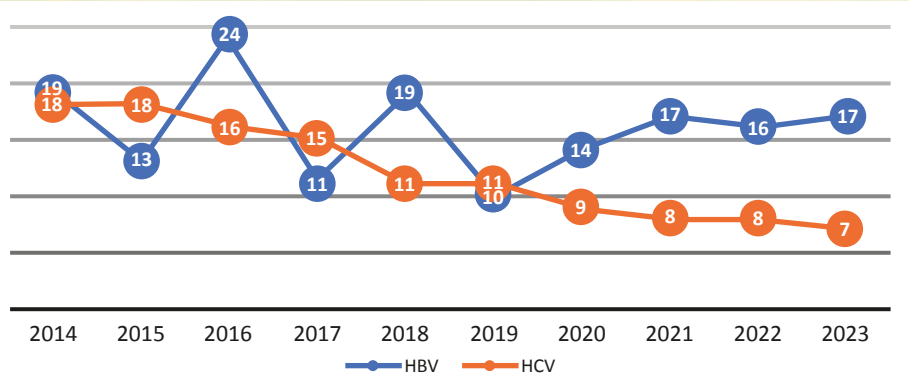
Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Table 31 - Hepatitis C tends from 2014 - 2023

Dialysis Centre	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rimba Dialysis Centre	12	12	11	9	6	4	4	4	4	2
Kiarong Dialysis Centre	0	0	0	0	0	0	0	0	0	0
Renal Dialysis Unit RIPASH	0	0	0	1	0	2	0	0	0	0
JPMC Renal Dialysis Unit	-	-	-	-	-	-	-	0	0	0
Tutong Dialysis Centre	0	0	0	0	0	0	0	0	0	0
Kuala Belait Dialysis Centre	6	6	5	5	5	5	5	4	4	5
Temburong Dialysis Unit	0	0	0	0	0	0	0	0	0	0
HD	18	18	16	15	11	11	9	8	8	7
PD	0	0	0	0	0	0	0	0	0	0
All	18	18	16	15	11	11	9	8	8	7

Legend: HD - Haemodialysis PD - Peritoneal Dialysis

Figure 15 - HBV and HCV trends from 2014 - 2023

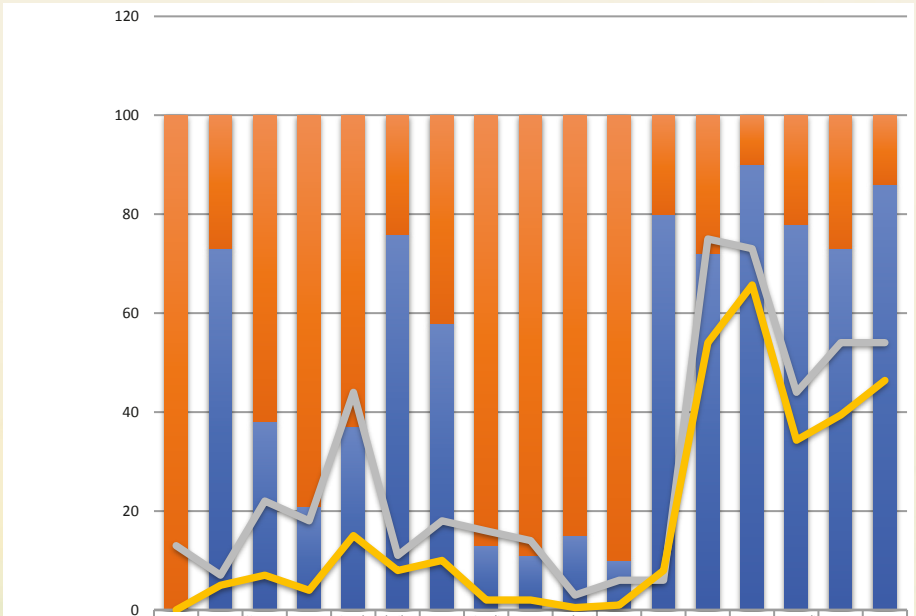


Chapter 12

Kidney Transplantation

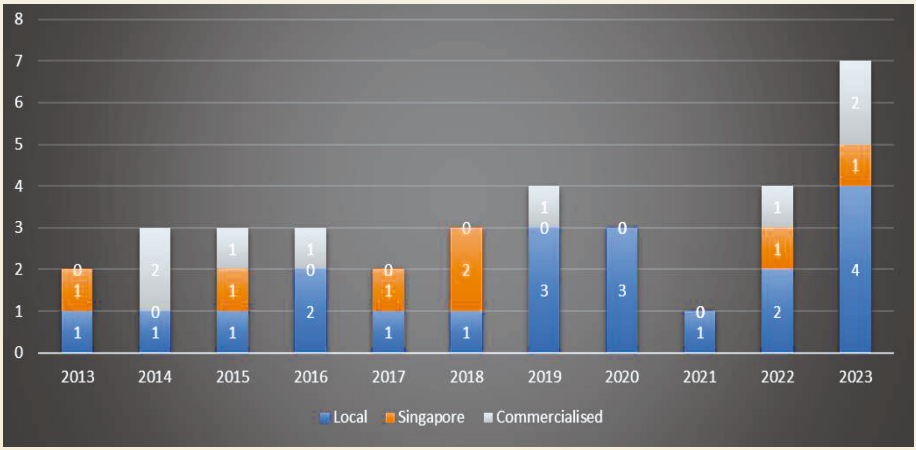
A total of 7 new transplantations were recorded in 2023; of which 4 were done locally in Jerudong Park Medical Centre. Additionally, another 1 transplant was performed in Singapore under government sponsorship. There were also 2 commercialised transplantations from Cambodia. The total of seven transplants in 2023 has yielded an annual transplant rate of 17 per million population, which is the second highest rate in South East Asia. At the end of 2023, there was 56 patients with functioning transplanted kidney grafts in the country. All the transplants in the country were from living related donations, but work has now been put in to implement a deceased donor transplant program in the next few years which should boost overall kidney transplant numbers.

Figure 16 - Comparison of KT rates with other countries



	Brunei	Hong Kong	Singapore	Qatar	South Korea	Thailand	Taiwan	Saudi Arabia	Japan	Malaysia	India	China	USA	Spain	Australia	UK	France
% from LKT	100	27	62	79	63	24	42	87	89	85	90	20	28	10	22	27	14
% from DDKT	0	73	38	21	37	76	58	13	11	15	10	80	72	90	78	73	86
Total KT rate (pmp)	13	7	22	18	44	11	18	16	14	3	6	6	75	73	44	54	54
Total DDKT rate (pmp)	0	5	7	4	15	8	10	2	2	0.5	1	8	54	65.7	34.3	39.4	46.4

Figure 17 - National KT trends from 2014 - 2023



BRUNEI DIALYSIS & TRANSPLANT REGISTRY 2023.
DEPARTMENT OF RENAL SERVICES
MINISTRY OF HEALTH

DIALYSIS PATIENT NOTIFICATION

Complete this form to notify all Dialysis patient in your Centre/Unit

*** Indicates required question***

1. Name:*

2. Bru-HIMS No:*

3. ID Card No:*

4. Date of Birth:*

5. Gender:*
   Mark only one oval

   - [ ] Male
   - [ ] Female

6. Race:*
   Mark only one oval

   - [ ] Malay
   - [ ] Chinese India
   - [ ] Other:

7. Date of start Dialysis:*

_____

Example: 7 January 2019

8. Number of years on Dialysis:* (Current date - date of start Dialysis)

_____

9. Modality:*
Tick all that apply.

- ☐ Haemodialysis (HD)
- ☐ Peritoneal Dialysis (PD)

10. Access on the 1st Dialysis:
Tick all that apply.

	Left	Right
AVF - Ateriovenolus Fistula	☐	☐
PC- Permanent Catheter	☐	☐
IJC - Internal Jugular Catheter	☐	☐
Other	☐	☐

11. Location:*

Mark only one oval.

- ◯ Rimba Dialysis Centre
- ◯ Tutong Dialysis Centre
- ◯ Kuala Belait Dialysis Centre
- ◯ Kiarong Dialysis Centre
- ◯ RIPAS Hospital Renal Dialysis Unit
- ◯ Temburong Dialysis Unit
- ◯ Peritoneal Dialysis Unit
- ◯ Transplant Unit
- ◯ JPMC Renal Dialysis Unit

DIALYSIS ANNUAL RETURN

DIALYSIS PARAMETERS

Please complete this form for each patient on Dialysis at your centre / Unit for the year 2023.

12. HEMOGLOBIN (HB) LEVEL*
(March - June)

13. HEMOGLOBIN (HB) LEVEL*
(Sept - Dec)

14. CALCIUM (ADJUSTED)*
(March - June)

15. CALCIUM (ADJUSTED)*
(Sept - Dec)

16. PHOSPHATE (LEVEL)*
(March - June)

17. PHOSPHATE (LEVEL)*
(Sept - Dec)

18. PTH LEVEL*
(March - June)

---

19. PTH LEVEL*
(Sept - Dec)

---

20. SYSTOLIC BLOOD PRESSURE (mmHg)*
(March - June)

---

21. DIASTOLIC BLOOD PRESSURE (mmHg)*
(March - June)

---

22. SYSTOLIC BLOOD PRESSURE (mmHg)*
(Sept - Dec)

---

23. DIASTOLIC BLOOD PRESSURE (mmHg)*
(Sept - Dec)

---

24. CURRENT TYPE OF ACCESS*
Mark only one oval.

- ◯ Arteriovenous Fistula (AVF)
- ◯ Permanent Catheter (PC)
- ◯ Internal Jugular Catheter (IJC)
- ◯ Others: _____

ARTERIOVENOUS FISTULA (AVF)

25. Date of AVF creation

_____

Example: 7 January 2019

26. State which specialty patient is referred:
Mark only one oval.

- ◯ PRS Clinic
- ◯ SOPD Clinic
- ◯ Vascular Clinic

27. VASCULAR ACCESS Current access site

Mark only one oval per row.

	RC	BC	BB
Right - (AVF)	◯	◯	◯
Left - (AVF)	◯	◯	◯

28. Date of 1st needling

Example: 7 January 2019

29. Outcome

Tick all that apply.

	1 month	3 month	6 month	>6 month
Immature	☐	☐	☐	☐
In use	☐	☐	☐	☐
Failure	☐	☐	☐	☐
Rest AVF	☐	☐	☐	☐

FOR HAEMODIALYSIS DIALYSIS (HD) PATIENT

30. UREA REDUCTION RATIO MEASUREMENT (URR%)
(March - June)

_____

31. UREA REDUCTION RATIO MEASUREMENT (URR%)
(Sept - Dec)

_____

32. BLOOD FLOW RATE OBTAINED (ml/min)
(March - June)

_____

33. BLOOD FLOW RATE OBTAINED (ml/min)
(Sept - Dec)

_____

FOR PERITONEAL DIALYSIS (PD) PATIENT

34. Date of PD start?

_____

Example: 7 January 2019

35. Number of years on PD (Current date - date of start PD)

_____

36. Dialysis vintage (Current years on PD - previous years on HD)

37. Type of PD?
Mark only one oval.

- Automated Peritoneal Dialysis (APD)
- Continous Ambulatory Peritoneal Dialysis (CAPD)

38. KT/V

39. Date of P.E.T done?

Example: 7 January 2019

40. P.E.T Status
Tick all that apply.

- LA
- L/LA
- HA

Your support and cooperation are very much appreciated.

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Abbreviations

APD – Automated Peritoneal Dialysis
AVF – Arteriovenous Fistula
BDTR- Brunei Dialysis and Transplant Registry
CAPD – Continuous Ambulatory Peritoneal Dialysis
CKD – Chronic Kidney Dialysis
CVVHDF- Continuous Veno-Veno hemodiafiltration
CVVHF - Continuous Veno-Venohaemofiltration
DBP – Diastolic Blood Pressure
DC – Dialysis Centre
DM – Diabetes Mellitus
ESKF – End Stage Kidney Failure
HD - Haemodialysis
IJC – Internal Jugular Catheter
JPMC -Jerudong Park Medical Centre
KB – Kuala Belait
KRT – Kidney Replacement Therapy
KT – Kidney Transplant
MOH – Ministry of Health
PC – Permanent Catheter
PD - Peritoneal Dialysis
PMP – Per Million Population
RIPAS – Raja Isteri Pengiran Anak Saleha
SBP – Systolic Blood Pressure
SLED – Slow Low Efficient Dialysis
SPAD – Single Pass Albumin Dialysis
TX - Transplant

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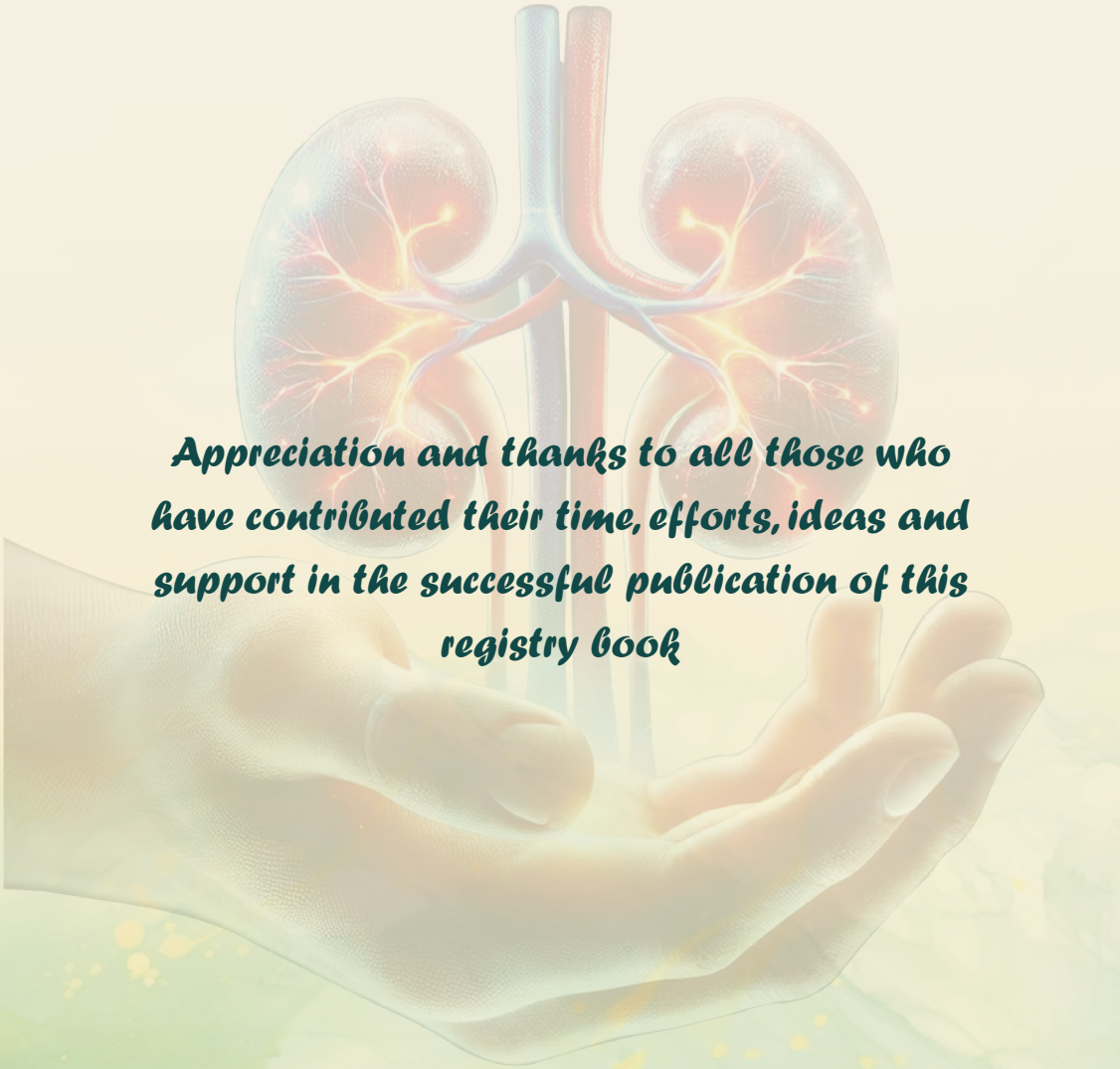

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Notes

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Department of Renal Services
Ministry of Health

Rimba Dialysis Centre Building
Jalan Kampong Rimba, Gadong BE3119
Bandar Seri Begawan
Brunei Darussalam

673 2454802 / 673 2457694 renal.department@moh.gov.bn