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CLINICAL STUDY

End stage renal disease in Brunei Darussalam – report from the first Brunei Dialysis Transplant Registry (BDTR)

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Abstract

The Brunei Dialysis and Transplant Registry (BDTR) was established in 2011 to collect data from patients undergoing renal replacement therapy (RRT) in Brunei Darussalam. The chief aims of the registry are to obtain general demographic data for RRT patients and to determine disease burden attributable to End Stage Renal Disease (ESRD). The registry population comprises of all ESRD patients treated in Brunei Darussalam. Data domains include general demographic data, medical history, ESRD etiological causes, laboratory investigations, dialysis treatment and outcomes. There were 545 prevalent RRT patients in Brunei at the end of 2011. The incidence and prevalence of ESRD were 265 and 1250 per million population. Hemodialysis (HD), Peritoneal Dialysis (PD) and Transplant comprised of 83%, 11% and 6% of the RRT population, respectively. Diabetes mellitus accounted for 57% of all new incident cases. The mean serum hemoglobin, phosphate, calcium and iPTH were 11.0 ± 1.6 g/dL, 1.9 ± 0.5 mmol/L, 2.3 ± 0.2 mmol/L and 202.5 ± 323.4 ng/mL. Dialysis adequacy for HD and PD were 65.1 (urea reduction ratio) and 2.0 ± 0.3 (Kt/v). 71 % of all prevalent HD had functioning AV fistulae and the peritonitis incidence was one in 24.5 patient-month/episode. The first BDTR has identified some deficiencies in the renal services in Brunei. However, it signals an important milestone for the establishment of benchmarked renal practice in the country. We hoped to maintain and improve our registry for years to come and will strive to align our standards to acceptable international practice.

Keywords

Brunei, dialysis, epidemiology, registry, renal failure

History

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Background

Data from patients on Renal Replacement Therapy (RRT) and Chronic Kidney Disease (CKD) are frequently collated and presented in renal registries. These registries are an integral part of quality control processes for renal replacement services and provide a tool for benchmarking of clinical outcomes within and between countries.[1] Most developed countries in the world also use registries to plan policies for healthcare provision and to provide data for research. Even among South East Asian countries, renal registries are commonplace and widely used. Malaysia, Philippines, Thailand and Singapore have renal registries which are accessible for review over the internet.[2–5] The UK and USA renal registries routinely compare and publish their dialysis prevalence, incidence and standards against those of other countries.[6,7]

The Brunei Dialysis and Transplant Registry (BDTR) was established by the Department of Renal Services, Ministry of Health in 2011 to collect data from patients undergoing RRT in Brunei Darussalam. The main motivation and impetus behind the establishment of a national registry is the concern on the growing impact of CKD in the country. This is done in partnership with the team responsible for the Malaysian Renal Registry (Malaysian Society of Nephrology). The idea behind the partnership was to enable Bruneian registry staff to obtain experience in setting up and maintaining a registry. In the short term, it is thought to be more cost effective to piggyback on an existing system which has proved to be effective and efficient. In the long term, it is hoped that the BDTR can become an independent and self-sufficient entity that can serve the required registry objectives of the country.

The number of patients reaching ESRD has increased significantly in the last 10 years. There were 281 patients in the chronic dialysis program in 2002 compared to 545 patients in 2011. During the same time period, the population of Brunei has increased from 340,800 to 422,700.[8] This corresponded with an increase of 94% in the dialysis population compared to the 24% increase in the general population over a 10-year period. The rapid disproportionate increase in the dialysis population meant that extra financial burden and workload were placed on the service providers in Brunei. In an idealistic modern environment, most of this workload can be off-set by shrewd financial planning and judicious use of advanced technology. More specifically in this context, there is a need to embrace the use of information technology to create, analyze and store information that will improve the quality of information stored in renal database. Before the establishment of the registry, there was little

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Table 1. Data domains and elements.

Data domains	Data elements
1. Identifier	Name, Identifying Document Numbers, Address, Contact numbers
2. Demographics	Age, Sex, Ethnicity, Educational attainment, Occupation, Household income group, Weight, Height, Use of tobacco
3. Medical history	Medical history/co-morbidities, Family History
4. ESRD diagnosis	Date of first diagnosis, Date re-entering each RRT
5. Laboratory investigations	Date & time of tests, Blood chemistry, Hematology, Serology
6. Treatment	Modalities of RRT
7. Outcomes	Patient survival; death, cause of death

Table 2. Prevalent RRT patients (2002–2011).

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
All patients	346	375	387	410	438	465	480	511	496	545
Haemodialysis	281	314	325	332	355	381	394	423	398	452
Peritoneal dialysis	55	51	51	64	69	65	63	58	66	60
Transplant	10	10	11	14	14	19	23	30	32	33

uniformity in the type of information being stored or regularity of this practice. As a result, historical data on RRT and CKD in Brunei were not easily accessible and analyzable. Furthermore, it was difficult to compare standards and targets with those of other countries due to the lack of concrete and reliable data. It is hoped that this current methodical approach of registering renal data will help to improve the delivery of renal service in the country.

Objectives and methodology

The main objectives of the registry are as follow:

(1) To provide basic demographic data for patients undergoing RRT.
(2) To determine the disease burden attributable to ESRD.
(3) To evaluate the RRT program and benchmark against other practices.
(4) To stimulate and facilitate research on RRT and ESRD.
(5) To assess Quality of Life (QOL) of patients on RRT.

This is a multi-centre, observational cohort designed to evaluate the health outcomes of patients with ESRD undergoing treatment at participating dialysis centers and hospitals. All the participating centers will provide information on their ESRD patients at pre-determined times and stages. In addition, information from the transplant cohort is provided by the transplant nurse co-coordinator at the same pre-determined times and stages. QOL scores are evaluated through internally validated, purpose made questionnaires.

The registry population comprised of all ESRD patients treated at Ministry of Health facilities in Brunei Darussalam. This population will cover all ESRD patients in Brunei as there are currently no other dialysis provider in the country. Non-Brunei citizens and residents who dialyze permanently in Brunei or who had functioning transplant grafts under long term follow up in Brunei are also included in the registry.

The data domains and related specific data elements to be collected by the registry are summarized in Table 1.

Results

The prevalence of ESRD had increased progressively from 1012 per million population in 2002 to 1289 per million population (pmp) in 2011. While there was a progressive increase in hemodialysis and transplant patients, the number of peritoneal dialysis patients remained almost the same in this 10-year period. The new dialysis acceptance or incident rate was 265 pmp and highest in the >65 age group (2333 pmp). There were 545 prevalent RRT patients in Brunei at the end of 2011. Hemodialysis, Peritoneal Dialysis and Transplant comprised 83%, 11% and 6% of the RRT population, respectively. Cardiovascular disease (43%) and sepsis (22%) were the main causes of deaths in 2011. Table 2 shows the prevalent dialysis patients from 2002 to 2011. Diabetes mellitus was the most common prevalent (34.4%) and incident (57.1%) cause of ESRD. Hypertension and Glomerulonephritis were the two next most common causes (Table 3).

Table 3. Incidence of presumptive etiological diseases (2011).

	Incidence (%)
Diabetes mellitus	57.1
Hypertension	21.4
Glomerulonephritis	9.8
Obstruction	2.7
Polycystic kidneys	0.9
Others	8.1

Table 4 shows the demographic data of HD and PD patients. The mean and median age of dialysis patients were 57 ± 12.5 and 56 years. The biggest dialysis age group was between 41 and 60 years (45%). The majority of the patients originated from Brunei-Muara District (69%) and were from a Malay ethnic background (85%). The biochemical, hematological and blood pressure results presented in Table 5 are the mean annual results for all hemodialysis and peritoneal patients. These results were usually collected on a three monthly basis and averaged out for the year. Results are generally expressed as mean $\pm$ standard deviation. Table 6 describes the general HD practice in the country. A significant proportion of HD patients (25%) still dialysed through temporary or semi-permanent dialysis catheters. Blood flow rate was usually less than 350 mililitres an hour. Most patients dialysed three times per week, four hours per session.

Table 4. General demographic details of hemodialysis and peritoneal dialysis patients.

	Number (*N*)	Percentage (%)
Total HD and PD patients	512	100
Age group		
0–20 years	20	4
21–40 years	143	28
41–60 years	231	45
60+ years	118	23
Sex		
Male	261	51
Female	251	49
District		
Brunei-Muara	351	69
Belait	84	16
Tutong	51	10
Temburong	26	5
Ethnic group		
Malay	435	85
Chinese	41	8
Others	36	7

Table 5. Biochemical, hematological and dialysis parameters for hemodialysis and peritoneal dialysis patients.

	HD	PD	All
Serum hemoglobin (g/dL)	11.1 ± 1.6	10.8 ± 1.4	11.0 ± 1.6
% patients on erythropoietin	97	87	94
% patients with Hb >10 g/dL	76	72	75
Serum phosphate (mmol/L)	1.9 ± 0.5	1.9 ± 0.6	1.9 ± 0.5
Serum calcium (mmol/L)	2.3 ± 0.2	2.4 ± 0.2	2.3 ± 0.2
Serum Ca x Ph product	4.2 ± 1.2	4.6 ± 1.3	4.3 ± 1.2
Serum iPTH (ng/mL)	199.5 ± 311.3	214.2 ± 319.5	202.5 ± 323.4
Serum albumin (g/L)	33.1 ± 4.8	30.5 ± 5.2	32.7 ± 4.3
Serum cholesterol (mmol/L)	3.9 ± 1.1	4.8 ± 1.2	4.1 ± 1.1
Systolic BP (mmHg)	149.0 ± 15.7	128.5 ± 15.9	145.7 ± 15.1
Diastolic BP (mmHg)	83.1 ± 8.9	82.2 ± 8.8	82.8 ± 9.1
Hep BsAg +ve (%)	3	5	3
Anti HCV +ve (%)	7	7	7
Urea reduction ratio (%)	65.1 ± 9.1	NA	NA
Kt/v	NA	2.0 ± 0.3	NA
% patients on AVF	71	NA	NA
Peritonitis rate (patient-month/episode)	NA	24.5	NA

Table 6. HD parameters.

	Number (*N*)	Percentage (%)
Total HD patients	452	100
Access		
Radio-cephalic Fistula	217	48
Brachio-cephalic Fistula	104	23
Catheter	113	25
Missing data	18	4
Blood flow		
200–249 mls/h	211	47
250–299 mls/h	172	38
300–349 mls/h	51	11
>350 mls/h	15	3
Missing data	3	1
HD sessions		
2 per week	3	1
3 per week	443	98
4 per week	6	1
Duration of session		
<3 h	8	2
3–4 h	441	98
>4 h	3	0

Table 7. Types of renal transplantation.

	Prevalent number (*N*)	Percentage (%)
Transplant	33	100
Live genetically related (parents and siblings only)	15	45
Live emotionally related (spouses only)	8	24
Unknown	10	30

All renal transplantations were performed abroad (Table 7). Detailed information from some patients were lacking due to failure of communication between foreign transplant centers and our centre.

Limitations

As registry data collection only started in 2011, survival analysis cannot be calculated. Many data from historical records were not complete and accurate and therefore not utilized in this registry. Staff shortage and inexperience and time constraint may have affected accuracy of results as not all domains of the registries are comprehensively filled (less than 100% return rates for data on hematology and biochemistry). Furthermore, accuracy of information in case notes or death certificates are often not verified by experienced doctors and could lead to inaccurate information being recorded. For example, most primary renal diseases were not diagnosed by renal histological studies and therefore, there may be a misleading tendency to presumptive diagnoses of hypertensive or diabetic renal disease.

Discussion

The results of this registry confirmed that Brunei had a high incidence and prevalence of ESRD in 2011. This is expected, considering that Brunei has a high standard of living and there is universal healthcare coverage in the country. National economic strength, often expressed as gross domestic product (GDP) had often been linked to prevalence of ESRD.[9,10] Brunei's GDP is US$40,700[11] would have put the country on par with many developed and affluent European and North American countries. Not surprisingly, the prevalent and incident figures of ESRD were equivalent to these nations. As the country is small, all residents are close to healthcare facilities and most patients lived within the catchment areas of the local dialysis centers. Moreover, Bruneian residents do not have to contribute towards health expenses and therefore all patients can afford and access RRT and its associated treatment (medicine, consultations and procedures). Neighboring Sabah and Sarawak (Malaysian states), which together with Brunei forms the northern part of Borneo island had lower prevalence of ESRD (389 pmp and 676 pmp, respectively) despite having similar ethnic composition as Brunei.[2] The difference could be accounted by the different population coverage and GDP. Another possible contributing factor is that Brunei had a relatively high physicians density of 141 (per 100,000 population) in 2012[12] compared to other neighboring countries like Malaysia (70), Thailand (37) and Indonesia (13).[13] Furthermore, the nephrologist to RRT

patients ratio (1:136) would have put Brunei nearly on par with that of UK (1 to 119)[14] and USA (1 to 85).[15] This could mean that most patients in Brunei had greater and easier access to renal doctors and therefore speculatively, were more likely to have renal diseases diagnosed.

Brunei had the highest obesity rate among South East Asian countries according to a recent WHO global database on BMI.[16] One can speculate that a high level of obesity indicate a sedentary and unhealthy lifestyle which could exacerbate underlying renal disease and ultimately leading to faster progression to ESRD. Furthermore, obesity can often lead to diabetes mellitus which causes kidney disease. The exact prevalence of diabetes mellitus in Brunei is unknown. Published estimates from the Ministry of Health, puts this figure to around 20%[17] and data from the International Diabetes Federation feature Brunei highly in diabetes prevalence rankings.[18] Other factors that can contribute to high ESRD prevalence include local cultural beliefs and traditional medicine, which may affect and delay the treatment of kidney disease.

Based on the results of this registry, we had overhauled our hemodialysis practice with a particular focus on improving URR and prevalent vascular access. The majority of our patients did not achieve adequate URR because of poor blood flow during HD sessions and the widespread use of temporary dialysis catheters. Historically, high blood flow had been wrongly associated with intra-dialytic symptoms like dizziness and hypotension in our population. As a result, most staff and patients believed that the optimal blood flow for HD was between 200 and 300 mls/min. traditionally, patients were also reluctant to have AV fistulae because of their unsightly appearances and pain associated with needle cannulations. Re-education of patients and staff had since improved HD blood flow to 300–400 mls/min. Efforts had been made to persuade patients to embrace the use of AV fistulae via education programs and personal communications. We endorsed several overseas working attachments for our dialysis nurses and doctors to allow exposure to international dialysis practices in the past few years.

We had also prioritized two major initiatives with an aim to decrease reliance on hemodialysis in the future. The Ministry of Health had sanctioned moves to set up a local transplant program and to embark on a peritoneal dialysis preference policy. The move to priorities PD and transplant was partly spurred by encouraging results attained by patients particularly with regards to quality of life and cost. Public awareness programs had been stepped-up in the country to raise the profile of these two dialysis modalities.

Conclusion

The first BDTR has identified some deficiencies in the renal services in Brunei. However, it signals an important milestone for the establishment of benchmarked renal practice in the country. While there are some aspects of renal care that need improvements, we have taken heart from the fact that most of our results and practices are not vastly inferior to those that are achieved by many developed and established countries. We hoped to maintain and improve our registry for years to come and will strive to align our standards to acceptable international practice.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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