Dialysis treatment in Indonesia: focus on Bali

To cite this article: I G R Widiana 2018 IOP Conf. Ser.: Mater. Sci. Eng. 434 012334

View the article online for updates and enhancements.
Dialysis treatment in Indonesia: focus on Bali

I G R Widiana*
Division of Nephrology and Hypertension School of Medicine Udayana University/Sanglah General Hospital, Bali, Indonesia

*rakawidiana@yahoo.com

Abstract. Treatment of ESRD patients has started in early 1990’s. In general all hospitals in Bali are well equipt with dialysis facilities. Prevalence rate of Hemodialysis is 479 per million population and incidence rate is 498 per million population in Bali. During 6 month of follow-up, the incidence of composite (hospitalization and or cardiovascular events) outcomes are 18.09% and mortality rate 8.11%. Etiology of underlying kidney disease and age more than 40 years are independent risk factors for composite outcome and on the other hand, use of AV-fistula and age more than 40 years are independent risk factors for death of any cause during 6 months of the follow-up. Five years total cost of HD is 37,616.98 USD with 358 days one year mean survival and 56.75 KDQOL. The implementation of universal social security system in Indonesia, that was effective by January 1, 2014 implicates financial coverage for dialysis patients. It produces a huge economic burden on health to the government. Continuous ambulatory peritoneal dialysis (CAPD) and living related kidney transplantation are alternative treatment for ESRD to reduce cost.

1. Introduction
Indonesia is an archipelagic country extending 5,120 kilometers (3,181 mi) from east to west and 1,760 kilometers (1,094 mi) from north to south 13,466 islands. Bali is an island and province of Indonesia. The province includes the island of Bali and a few smaller neighboring islands, notably Nusa Penida, Nusa Lembongan and Nusa Ceningan. It is located at the westernmost end of the Lesser Sunda Islands, with Java to the west and Lombok to the east. Its capital, Denpasar, is located in the southern part of the island. With a population of 3,890,757 in the 2010 census, and 4,225,000 as of January 2014, the island is home to most of Indonesia's Hindu minority. According to the 2010 Census, 83.5% of Bali's population adhered to Balinese Hinduism, followed by 13.4% Muslim, Christianity at 2.5% and Buddhism 0.5% [1].

There were a total 460 hemodialysis units with 6604 hemodialysis machines in Indonesia in 2016. In principles, a hemodialysis unit should be run by a nephrologist, however, due to lack of nephrologist, in some hemodialysis units, nephrologists delegates to the internists. These internist have been trained for three months. In hemodialysis unit, the nephrologists are visiting doctors pose as consulting and supervising nephrologist. In majority of (91.8%) hemodialysis unit are affiliated to hospitals and the rest were out patient in HD clinics (8.2%) [2-4].
Indonesia Society of Nephrology reported through Indonesian Renal Registry that there were 4977 new patients and 1885 active patients in 2007 and 5029 new patients and 7381 active patients by 2014, 7465 new patients and 9382 active patients by 2015 and 6288 new patients and 14869 active patients by 2016. Number continuous ambulatory peritoneal dialysis (CAPD) is reported that there were 674 new CAPD, 421 stop CAPD, and 1674 still-active CAPD patients consecutively in 2015, and meanwhile there were 547 new CAPD, 627 stop CAPD, and 1594 still-active CAPD patients consecutively in 2016.

2. Hemodialysis in Bali
Bali is a popular tourist destination, which has seen a significant rise in tourists since the 1980s. Tourism-related business makes up 80% of its economy. It is renowned for its highly developed arts, including traditional and modern dance, sculpture, painting, leather, metalworking and music. The island of Bali lies 3.2 km east of Java, and is approximately 8 degrees south of the equator. East to west, the island is approximately 153 km (95 mi) wide and spans approximately 112 km (69 mi) north to south; administratively it covers 5,780 km$^2$, or 5,577 km$^2$ without Nusa Penida District, its population density is roughly 750 people/km$^2$ [1]. Hemodialysis treatment in Bali started in early 1990’s, with several HD machines at Sanglah Central Hospital. Afterward, there has been increasing demand of HD treatment associated with the increasing incidence of diabetes mellitus and hypertension in the population. This increased demand was steeply increased after the implementation of BPJS, a national health insurance which universally covers around 80% of Indonesian population until today. Island of Bali consisted 9 regencies with class B hospitals. All regencial hospitals are equipt with dialysis unit. There are 41 dialysis unit with 455 machines mostly Nepro, Fresninius and B Braun brands and run by 335 dialyss nurses including 274 certificated nurses. Region of Bali has join the Indonesian Renal Registry (IRR), a national network for renal data, centered in Bandung West Java. It was reported that, there were 1870 patient who undergoing regular hemodialysis in Bali resulting prevalence rate of 479 per million population. The highest cause of ESRD was chronic pyelonephritis (844 cases) followed by diabetic nephropathy (312 cases), hypertensive nephropathy (247 cases), lupus nephritis (176), primary glomerulopathy (132) and others, see figure 2 [4].

Figure 1. Map of Bali Island
A majority of kidney disease underwent HD were end stage kidney disease, followed by acute kidney injury and acute in chronic kidney disease. Hemodialysis treatment for acute kidney injury mostly using sustained low efficiency dialysis (SLED), in particular those ICCU patients and hemodinamically unstable patients, see figure 3. There were 1928 (498 per million population) new patients reported in Bali during 2017. With regard to type of HD treatment, HD session delivered were regular HD (standards twice HD per week), acute HD (for severe uremic syndrome patients), extra HD (mostly one addition of twice HD per week, due to specific condition) and hybrid HD (mostly sustained low efficiency dialysis or SLED [4].

There were reports of surrogate parameters of dialysis adequacy in a center in Denpasar Bali. This center has reported that in twice weekly dialysis, although patients with targeted KT/V of 1.8 or more or urea reduction ration (URR) 85% or more was 36.8% and 39.0% consecutively, however, those who has serum albumin concentrations 4 g/dL or more were 84%, see figure 10. There were 40 patuents with composite (hospitalization and or cardiovascular events) outcomes among 222 pasien (18.09%) within 6 month (184 days) of follow-up yielding average of cummulative survival time $164.83 \pm 3.57$ days. Most of hemodialysis patients who hospitalized were due to health center associated pneumonia (59%), followed by cardiovascular event (23%) and others (enedrysta of AVF, urinary tract infection, infection of vascular access< and deep vein thrombosis), see figure 5 [4].
Figure 4. Cummulative composite end points (cardiovascular events, hospitalization and death) of HD patients at Sanglah Hospital Denpasar.

There was 18 death from any cause outcomes among 222 pasien (8.11%) within 6 month (184 days) of follow-up yielding average of cumulative survival time $177.34 \pm 2.00$ days. Most of hemodialysis patients died due to cardiovascular events (56%) and septic shock (44%), see figure 5 [5].

![Cumulative survival (composite)](image1)

Figure 5. Cummulative composite death HD patients at Sanglah Hospital Denpasar

Multivariate Cox’s regression analysis showed that, etiology of underlying kidney disease and age more than 40 yeas were independent risk factors for composite outcome during 6 months of the follow-up. On the other hand, use of AV-fistula and age more than 40 yeas were independent risk factors for death of any cause during 6 months of the follow-up (see tabel 1 and 2) [5].
Table 1. Independent risk factors for composite end point among regular hemodialysis during 6 months of follow-up

| Risk factors                          | B   | p-value | odds ratio | 95% CI   | OR   |
|---------------------------------------|-----|---------|------------|----------|------|
| **Etiology:**                         |     |         |            |          |      |
| Diabetic Nephropathy                  | 0.29| 0.79    | 1.33       | 0.16     | 11.06|
| Hypertensive Nephrosclerosis          | 0.02| 0.98    | 0.98       | 0.11     | 8.47 |
| **Nephrosclerosis**                   |     |         |            |          |      |
| Chronic Pyelonephritis                | 1.01| 0.33    | 0.36       | 0.05     | 2.74 |
| Chronic Glomerulonephritis            | 1.46| 0.24    | 0.23       | 0.02     | 2.66 |
| AV Fistula                            | 1.01| 0.01    | 0.37       | 0.17     | 0.77 |

Table 2. Independent risk factors for death of any cause among regular hemodialysis during 6 months of follow-up

| Risk factors       | B   | p-value | odds ratio | 95% CI   | OR   |
|--------------------|-----|---------|------------|----------|------|
| Anemia             | 0.62| 0.058   | 1.86       | 0.98     | 3.54 |
| AV Fistula         | 0.79| 0.028   | 0.46       | 0.23     | 0.92 |
| Age                | 0.67| 0.047   | 0.51       | 0.26     | 0.99 |

Hemodialysis (HD) treatment is a high volume, high cost, and high risk of medical services. Most of HD treatment in Indonesia and it is universally covered by National Health Insurance. We studied economic analysis of regular hemodialysis treatment in ESRD at Sanglah Hospital Bali. This economic analysis study is aimed to calculate HD costs and its components, and outcomes. We calculated direct, indirect and intangible cost during 5 years in 30 HD patients which were randomly selected from medical records. It was shown that mean total direct cost 437,093,800 IDR (31,452.39 USD) including double lumen catheter insertion 4,180,526 IDR (300.82 USD); AV-fistula 5,537,683 IDR (398.48 USD); HD treatment 351,00.000 IDR (25,257.25 USD); medicines 59,852,000 IDR (4,306.82 USD), including EPO, intravenous iron and oral medicines; lab tests and radiology examination 15,665,000 IDR (1,127.22USD); mean indirect cost 41,981,333 IDR (300,20.89 USD), consists of transportation expenses and meals; mean intangible cost (loss of job opportunities) 44,546,666 IDR (3,205.49 USD) calculated from patient’s salary or provincial minimum wages, leading to total cost 522,763,210 IDR (37,616.98 USD) for 5 years of HD treatment. We also found that among 223 patients mean KDQOL was 56.75 ±21.00. During one years of followed up, among 222 patients evaluated, 18 patients died, leading to 91.9 % of one year survival, with mean survival time 358 days (95%CI: 354 -362 days). We conclude that five years total cost of HD is 37,616.98 USD with 358 days one year mean survival and 56.75 KDQOL [6]. USRD in 2010 has shown that during pre-dialytic compared to prepare for dialysis period, cost spent is increased by around seven times, this cost will reduced and stabilized to around three times compared to pre-dialytic period which the treatment based on medical approach to delay chronic kidney disease progression [7].

In 2013 president of Republic of Indonesia has issued a President Decree No. 12/2013, as amended by President Decree No. 111/2013, regarding Healthcare Insurance managed by the newly established Healthcare and Social Security Agency (Badan Penyelenggara Jaminan Sosial Kesehatan or “BPJS Kesehatan”). Both the Healthcare and Worker Social Security schemes are compulsory for all workers. The Healthcare Insurance program is handled by BPJS Kesehatan Employees are required to participate and contribute to this healthcare scheme. Indonesian citizens and all residents of Indonesia, including long term expatriate employees, are required to join. Registration with BPJS covers the whole family. Only one spouse is required to contribute to gain family coverage. Universal coverage for all Indonesian
by 2019 [8-9]. This health care insurance has totally covered dialysis treatment. During 2014 BPJS has reported that kidney failure patients has claimed the second top of list of catastrophic disease after heart diseases. It is shown that during 2014 it was 2,165,507,578,258 IDR or around 161,606,000 USD was claimed by kidney failure patients. [8] Most of BPJS funding comes from national budget or regional government budget targeting to support poor populations and some comes from civil servants, public fund as subscription of individuals or private company workers. This fund will mostly go to secondary or tertiary centers where dialysis service running [9].

Hemodialysis is a health service with characteristic of high cost, high volume, and high risk, therefore, it needs standardized service through evidence based national clinical guideline and implemented as hospital standard procedure. It should be supported by well organized dialysis unit and competent human resources. The basic of hemodialysis should be aimed at good outcomes and manifested reduced mortality with low cardiovascular complication, good nutritional status, and optimal quality of life. It may be achieved by targeted KT/V, maintenance of vascular access, adapted technology of dialysis machine and dialyzer. Implementation of health technology assessment and anti fraud regulation on this technology application will lead to a cost-effective service in expensive dialysis treatment [10-13] Human resources which are involved in dialysis unit in Indonesia that regulated by Indonesian Society are nephrologist, internist with three months hemodialysis training and general practitioner with three months of hemodialysis training[9-10]. Traveler with regular hemodialysis who are going to visit Bali can be hemodialyzed in the hospitals or HD clinics. They have to bring travelling HD data with them and contact the Unit in advanced [11]. Most of financial support of hemodialysis treatment comes from BPJS (Healthcare social security agency). Nowadays around 80% of Indonesia population has been covered by this insurance agency. A minority of population are supported by regional health assurance, other commercial assurance, and fee for service [8].

In order to choose more cost-effective treatment in dialysis service, Ministry of health has performed HTA (health technology assessment) in 2015 has evaluate cost effectiveness between hemodialysis and CAPD. PD first policy is estimated to preserve around 91.2 trillion IDR during 5 years, although in first years expenses is greater. On the other hand hemodialysis expense more steadily through the years. Minister of health agrees to implement “PD first policy” begin with piloting program in some region and this policy is targeted to achieve by 2019, that is 30% of ESRD patients will be treated with CAPD [14]. Studies in same countries have shown that kidney transplantation is more cost-effective than dialysis treatment[15-17]. Indonesian Ministry of Health in conjunction with thirteen Major Hospital in Indonesia have launched development kidney transplantation program. Sanglah Hospital in Denpasar Bali has started this program in the early 2016, and become the first Hospital in East Indonesia. Until April 2018 Sanglah Hospital has succeeded ten kidney transplantions in previously HD patients.

3. Summary
Prevalence rate of Hemodialysis is 479 per million population and incidence rate is 498 per million population in Bali. During 6 month of follow-up, the incidence of composite (hospitalization and or cardiovascular events) outcomes are 18.09% and mortality rate 8.11%. Etiology of underlying kidney disease and age more than 40 yeas were independent risk factors for composite outcome and on the other hand, use of AV-fistula and age more than 40 yeas were independent risk factors for death of any cause during 6 months of the follow-up. Five years total cost of HD is 37,616.98 USD with 358 days one year mean survival and 56.75 KDQOL. Continuous ambulatory peritoneal dialysis (CAPD) and living related kidney transplantation are alternative treatment for ESRD patients in Bali.

References
[1] https://en.wikipedia.org/wiki/Geography_of_Indonesia
[2] http://worldpopulationreview.com/countries/indonesia-population. Fifth report of Indonesian Renal Registry 2012. Indonesian Society of Nephrology.
[3] Seventh report of Indonesian Renal Registry 2014. Indonesian Society of Nephrology
[4] Nineth report of Indonesian Renal Registry 2016. Indonesian Society of Nephrology
[5] Mahendra IB. Incidence and risk factors of cardio-cerebrovascular events, hospitality and mortality of regular hemodialysis patients at Sanglah Hospital Bali. Thesis. 2018. (in press).
[6] Rama-Putra I Made and Raka-Widiana I Gde. Economic Analysis of Regular Hemodialysis Treatment in End-Stage Kidney Disease (Abstract). Annual Scientific Meeting, ANZSN 2018 (in press).
[7] United State Renal Data System (USRDS) 2010;1:137
[8] BPJS Kesehatan: A new medicare system? IES Bulletin February 2014. IES Bulletin, February 2014 KPMG Advisory Indonesia
[9] BPJS: Transaction of BOA 31 December 2014.
[10] Guideline on Hemodialysis Services on Health Care Facilities. Directorate of Bina Pelayanan Medik-Specialistik, Directorate General of Bina Pelayanan Medik Ministry of Health 2008
[11] Regulation of Minister of Health Republic of Indonesia Number 812, 2010 About Dialysis Services on Health Care Facilities (Ina)
[12] Prevention and Law Enforcement System of Fraud in Health Services. Laksono Trisnantoro, Hanevi Jasri, Puti Aulia Rahman. Center of Health Policy and Management Faculty of Medicine University of Gadjah Mada Yogyakarta. Jakarta, 11 September 2014
[13] Regulation of Minister of Health Republic of Indonesia Number 36, 2015 About Prevention of Fraud in the Implementation of Health Care Insurance on National Social Security System (Ina)
[14] Health Technology Assessment Development in Indonesia: Progress and Challenges. Health Technology Assessment Commission, Ministry of Heath Republic of Indonesia, March 2016.
[15] Sanchez-Escudo A, Alsina A, Diekmann F, Revuelta I, Esforzado N, Ricart MJ, Cofan, JV, Torregrosa JV, Campistol JM, Oppenheimer F, dan Fernandez E. Economic analysis of the treatment of end-stage renal disease treatment: living-donor kidney transplantation versus hemodialysis. Transplantation Proceeding 2015;47: 30-33.
[16] Purnell TS, Auguste P, Crew DC, Lamprea-Montalegre J, Olufade T, Geer R, Ephraim P, Shey J, Kostecki D, Powe NR, Rabb H, Jaar B, dan Boulware LE. Comparison of life participation activity among adults treated by hemodialysis, peritoneal dialysis, and kidney transplantation: A systematic review. Am J Kidney Dis 2013; 62(5):953-73.
[17] Dominguez J, Harrison R, dan Atal R. Cost-benefit estimation of cadaveric kidney transplantation: The case of developing country. Transplantation Proceeding 2011; 43:2300-04.