



Cost of Illness of Chronic Kidney Disease with Hemodialysis at Dr. Moewardi Surakarta Hospital

Elsa Mahardika Putri¹; Tri Murti Andayani²; Opstaria Saptarini¹

¹Universitas Setia Budi Surakarta, Indonesia

²Universitas Gadjah Mada, Indonesia

<http://dx.doi.org/10.18415/ijmmu.v10i10.5164>

Abstract

Hemodialysis is needed for a long period of time and also requires a lot of money. The purpose of this study was to determine differences in patient characteristic factors on direct medical costs in chronic kidney disease (CKD) patients with hemodialysis procedures and to find out the average cost of inpatient CKD treatment with hemodialysis. This research is a non-experimental study with data taken retrospectively at Dr. Moewardi in the period July-December 2022. The research subjects were CKD patients with inpatient and outpatient hemodialysis procedures. Cost data were then analyzed using descriptive analysis, the one sample t test was used to compare the average cost of hemodialysis treatment with the INA-CBG's rates, the Mann-Whitney and Kruskal-Wallis tests to determine differences in real costs in terms of age, gender, length of stay, frequency of hemodialysis and number of comorbidities. The results showed that there were 75 patients with CKD with hemodialysis inpatients. The cost of illness for CKD patients undergoing hemodialysis is IDR 995,141,718.00. In inpatients there are differences in total direct medical costs on gender, age, frequency of HD and LOS. The difference between real costs and INA-CBG's rates is found in groups N-4-10-II class II and III, N-4-10-III class III, N-1-12-I class I and III, N-1-12-II class I and III and N-1-12-III.

Keywords: *Cost of Illness; CKD; INA-CBG's; Hemodialysis*

Introduction

Kidneys are very important organs for the body. Quoted from the Ministry of Health, chronic kidney disease is a kidney disease that has a high risk of death and high medical costs. Kidney disease is the 10th cause of death in Indonesia with more than 42 thousand deaths per year. Chronic kidney disease is a global health problem because the prevalence of kidney disease is increasing day by day. But not only that, this disease is progressive and incurable, has a high mortality rate, and is expensive (Reaginta et al, 2022).

Hemodialysis (HD) is the most common form of renal replacement therapy worldwide, accounting for approximately 69% of all renal replacement therapy and 89% of all dialysis. Over the past six decades since the inception of HD, dialysis technology and patient access to therapy have advanced rapidly, especially in high-income countries. However, the availability, accessibility, costs and outcomes of HD vary widely around the world and overall. Patients with HD have a high symptom burden and are

often under considerable financial pressure (Bello et al, 2022).

The National Health Insurance (JKN) system only accepts one payment option. It is based on the INA-CBG rate and is a package system. The hospitals' financial performance is impacted by the system overhaul. By eliminating non-value-adding operations, the prospective payment (INA-CBGs systems) often generates greater financial surplus and is more effective in terms of cost reduction (Happy, 2018).

Regional general hospital Dr. Moewardi is abbreviated as RSUD Dr. Moewardi or RSDM is a Central Java provincial government hospital located in Surakarta, Indonesia. RSDM is also a regional referral hospital, covering the southern part of Central Java and western East Java and serving patients registered with JKN. Therefore, a pharmacoeconomic study is needed. Pharmacoeconomic studies can provide indications for relatively efficient therapies by comparing the costs and consequences of several alternative programs and interventions.

Research Method

This research is a non-experimental analytic study with a cross-sectional study design (Thompson & Panacek, 2007). Data were taken retrospectively from the medical records of patients with National Health Insurance (JKN) chronic kidney failure with outpatient hemodialysis. Medical record data taken for the period July to December 2022. The cost coverage in the study conducted is direct medical costs. This research was conducted based on the opinions and perspectives (Sirajuddin, 2015; Serasi & Hakim, 2015; Armaya dkk, 2022) from the hospital as a health service provider.

Result and Discussion

Characteristics of CKD Patients on Hemodialysis

The results of the research that was carried out obtained 75 samples that met the inclusion and exclusion criteria with the main diagnosis of N18.5. An overview of the characteristics of inpatient CKD patients undergoing hemodialysis can be seen in Table I.

Table I. Characteristics of Inpatient CKD Patients on Hemodialysis for the Period July-December 2022

Characteristics of patients	Amount	Percen (%)
Gender		
Male	39	52
Female	36	48
Age		
45-54 years old	20	26,6
55-64 years old	26	34,6
65-74 years old	29	38,6
HD frequency		
1 time / inpatient episode	45	60
≥ 2 times /inpatient episode	30	40
Length Of Stay (LOS)		
< 5	27	36
5-10	39	52
>10	9	12
Amount of comorbidities		
CKD without comorbidities	31	41
CKD + 1 comorbidity	29	39
CKD+ >1 comorbidities	15	20

Based on the data obtained as shown in Table I, the number of CKD patients undergoing hemodialysis who are male in inpatients is 52% and for outpatients is 58%. This is in line with research by Saputra *et al* (2020) and the results of Aditianti *et al* (2020) that the majority of CKD patients undergoing hemodialysis are male.

In the age group, it can be seen that the most people who perform hemodialysis are in the 65-74 year age category, with percentages of 42.1% and 44.9%. then followed by second place, namely the 55-64 year age category with percentages of 31.3% and 28.9%, this is in line with Aditianti *et al* (2020), that the prevalence of CKD increases with increasing age. Age is one of the factors that influence the incidence of chronic kidney disease. As we get older, the body's cells weaken, this is a natural thing, as does kidney function. At the age of 40 years the number of functioning nephrons decreases by 10% every 10 years (Baroleh, 2019).

Age is one of the factors that influences changes in kidney function due to the aging process. There is a decrease in kidney mass between the ages of 30-80 years and a decline in kidney function can begin to appear after the age of 50 years (Rachmawati *et al*, 2019). This study also grouped the frequency of hemodialysis into 2 groups, namely 1 time per inpatient episode and more than 2 times per inpatient episode. The research results showed that the highest number of patients was once per inpatient episode with 45 (60%) patients.

Comorbidity is referred to as the occurrence of conditions or diseases other than CKD. Based on research results, the number of comorbidities in hospitalized CKD patients who experience 1 type of comorbidity is quite high. The presence of comorbidities after experiencing kidney problems in CKD patients undergoing hemodialysis cannot be avoided. Based on the research results, regarding the number of comorbidities, the results showed that CKD without comorbidities was 31 patients (41%). And CKD with 1 comorbid amounted to 29 patients (39%).

Cost analysis of Inpatient CKD Treatment with Hemodialysis

Analysis of direct inpatient medical costs was carried out by calculating the total components of direct medical costs provided during treatment during the period July-December 2022. Details of the costs for CKD patients undergoing HD can be seen in Table II.

Table II. Components of direct medical costs for CKD patients undergoing hemodialysis

Cost component (Treatment Episode)	Total cost (Rupiah) (%)	Average±SD (Rupiah)
No Surgery		
Inpatient Installation Costs (65)	209.589.280,00 (30%)	3.224.450,00±215.693,04
Pharmacy Costs (65)	216.955.482,00 (31%)	3.337.776,64±1.869.534,19
Hemodialysa Cost (65)	44.255.959,00 (6,4%)	680.860,78±665.652,21
Laboratorium Cost (65)	189.191.564,00 (27,3%)	2.910.689,44±1.648.934,21
Emergency Installation Costs (43)	10.637.320,00 (1,5%)	247.379,53±108.428,95
Radiology Cost (58)	22.709.342,00 (3,3%)	391.540,37±262.708,39
Sub Total	693.338.947,00	115.556.491±99.255.665,9
With Surgery		
Pharmacy Costs (10)	52.271.624,00 (22,6%)	5.227.162,40±2.895.598,40
Inpatient Installation Costs (10)	66.264.750,00 (28,6%)	6.626.475,00±7.285.521,68
Surgical Installation Costs (10)	45.915.000,00 (19,9%)	4.591.500,00±3.058.954,86
Biaya laboratorium (10)	31.106.030,00 (13,5%)	3.110.603,00±2.021.958,65
Hemodialysis Cost	29.782.391,00 (12,9%)	2.978.239,10±2.104.455,11
Radiology Cost (8)	5.069.962,00 (2,2%)	633.745,25±506.353,37
Emergency Installation Costs (7)	1.263.625,00 (0,5%)	180.517,85±95.075,36
Sub Total	231.673.382,00	33.096.197,43±23.964.891,62
TOTAL	925.012.329,00	71.154.794,54±78.884.194,66

The components of direct medical costs are pharmaceutical costs, inpatient installation costs, hemodialysis costs, laboratory costs, emergency room costs, radiology costs and surgical installation costs as shown in table 6. The total costs for patients without surgery are higher than surgical patients because the number of patients without surgery was greater, namely 65 patients and patients with surgery were 10 patients. The largest cost component for inpatients without surgery is pharmaceutical costs IDR 216,955,482.00 (32%).

These high pharmaceutical costs can be caused by the presence of comorbidities and their severity so that the cost of medical materials and drug costs are needed to treat the main disease and comorbidities. According to the results of Efendi's research (2019), the high cost of medicines and medical devices cannot be separated from the large number of drugs prescribed for the treatment of primary diagnoses and secondary diagnoses that follow which are complications of the main disease. In this study, patients with surgery in question are patients with operative procedures with the installation of access to perform HD, different from inpatients without surgery, for patients with surgery the cost of inpatient installation is the largest cost, namely IDR 66,264,750.00 (31 %). This is because patients with surgery take longer to recover so that the cost of inpatient installation can increase even more. This could happen because the longer a person's hospitalization, the more the total costs incurred, as well as treatment classes, treatment classes have different price ranges. Similar to the results of research conducted by Nurwanti, (2018), the cost component that incurs the largest amount during treatment is inpatient costs. Where the longer the patient stays, the bigger it tends to be. The highest cost for an inpatient installation is IDR 24,251,000.00 with a length of stay of 11 days in class 2 treatment class. The high cost of inpatient care could also be due to the class of room taken.

Analysis of Patient Characteristics of Direct Medical Costs

Analysis of patient characteristics was carried out to determine the factors that influence the direct medical costs incurred by CKD patients who undergo hemodialysis. The research results are presented in table III.

Table III. Test results of different characteristics of inpatients on direct medical costs

Patient characteristics	Group variations	Total cost (Rupiah)		
		Average	SD	P
Gender	Male	11.087.694,18	5.604.923,11	0,816
	Female	12.857.934,44	12.050.143,82	
Age	45-54 y.o	11.306715,70	5.167.560,83	0,824
	55-64 y.o	14.066.525,12	14.272.560,29	
	65-74 y.o	10.583.609,03	5.126.228,20	
HD Frequency	1 x/episode	8.922.918,57	3.865.091,39	0,000
	≥ 2 x/episode	16.459.145,90	12.669.581,86	
LOS (day)	<5	8.020.606,34	3.000.374,56	0,000
	5-10	1.292.003,03	11.132.512,16	
	>10	20.576.254,78	4.867.012,12	
Amount of comorbidities	No	9.780.357,64	5.258.120,13	0,100
	1 comorbidities	13.583.461,96	13.230.837,49	
	>1 comorbidities	12.983.865,53	6.279.166,90	

The analysis used is a test of differences between factors that are thought to influence the total amount of direct medical costs incurred. Table III shows the results of statistical analysis between the gender factor on total direct medical costs, obtaining a significance value of $p=0.816$ ($p<0.05$). This large value means that there is no difference between male and female gender in the total direct medical costs incurred. This is in line with the results of research by Roggeri *et al.*, (2014) that in the end-stage CKD population with inpatient hemodialysis there was no significant difference between men and women in the total medical costs incurred.

In terms of patient age characteristics, analysis of patient age characteristics used Kruskal-Wallis analysis with a value of $p = 0.824$ ($p > 0.05$), which means there is no significant difference between age categories. Similar to the results of research conducted by Fauziah (2015) the difference in patient age did not make a significant difference to the direct medical costs incurred.

Analysis of the frequency of patients undergoing hemodialysis at RSUD Dr. Moewardi used *Mann-Whitney* analysis to obtain a value of $p=0.038$ ($p <0.05$), which means there is a significant difference in total direct medical costs on the frequency of hemodialysis. This means that showing the number of times a person performs hemodialysis will also affect costs. Likewise, the results of research on 9 hemodialysis frequencies showed a significant difference ($p<0.05$), which means that hemodialysis frequency has an effect on hemodialysis costs.

Analysis of length of stay (LOS) using *Kruskal-Wallis* analysis obtained a significance value with a value of $p= 0.000$ ($p<0.5$) which shows that there is a significant difference in the length of stay. The longer the hospitalization, the higher the costs that must be incurred, starting from inpatient installation costs, medical costs, etc. Similarly, research conducted by Hadi *et al.*, (2021) shows that LOS shows significant results ($p<0.05$), which means it has an influence on costs.

The results of the analysis for comorbid factors using *Kruskal-Wallis* analysis showed a value of $p = 0.100$ ($p> 0.05$), this value means that there is no significant difference between comorbid factors and the total direct medical costs incurred by CKD patients who undergo hemodialysis at RSUD Dr. Moewardi Surakarta. This can happen because there are many components that make up the total direct medical costs of inpatients, causing comorbid factors to have no effect on the total direct medical costs incurred.

Comparison of Hospital Rates and INA-CBG's Rates

The results of the analysis showed that there were differences between hospital rates and INA-CBG's rates in several groups with a p value <0.05 . A comparison of hospital rates and INA-CBG's rates for the July-December 2022 period can be seen in table IV.

Table IV. Comparison of hospital rates and INA-CBG's rates for inpatient CKD patients on hemodialysis at Dr. Moewardi Regional Hospital, Surakarta for the period July to December 2022

Grouping INA- CBG'S	Class	N	INA-CBG's Cost (Rp)	Average hospital rates (Rp)	SD (Rp)	P
N-4-10-1	1	2	6.436.400,00	5.317.201,50	1.639.144,93	0,511
	3	5	4.597.400,00	5.008.191,20	789.087,60	0,309
N-4-10-II	1	5	7.785.000,00	8.554.776,4	3.067.412,03	0,605
	2	8	6.672.800,00	9.425.659,75	2.810.653,08	0,028
	3	11	5.560.700,00	8.992.110,00	4.476.156,61	0,029

N-4-10-III	1	1	11.450.500,00	4.916.162,00	-	-
	2	2	9.814.800,00	16.568.460,50	544.861,83	0,036
	3	1	8.179.000,00	10.802.558,00	-	-
N-1-12-1	1	3	8.430.600,00	10.785.420,33	507.516,56	0,015
	2	1	7.226.200,00	15.032.918,00	-	-
	3	4	6.021.800,00	8.786.304,00	789.673,31	0,006
N-1-12-II	1	7	16.784.400,00	10.192.611,29	1.519.538,53	0,000
	2	5	14.386.600,00	13.244.996,40	3.613.703,29	0,519
	3	14	11.988.800,00	13.034.937,36	1.726.464,44	0,041
N-1-12-III	1	2	36.422.700,00	26.960.400,50	260.835,42	0,012
	2	2	31.219.400,00	12.957.132,00	390.431,83	0,010
	3	2	26.016.200,00	20.625.249,50	196.904,48	0,016

The group with a total hospital rate greater than the INA-CBG's rate is the N-4-10-III class 2 grouping with a length of stay of 12 days and a HD frequency of 3 times per inpatient episode where the average hospital rate is higher than with hospital rates with a p value of 0.036 ($p < 0.05$). This shows that there is a significant difference between hospital rates and INA-CBG'S rates. This also shows that the longer the LOS and the more HD frequencies, the greater the total cost.

According to Azalea *et al*, (2016) the reason that INA-CBG's rates are higher than hospital rates is because INA-CBG's rates are largely determined by the service output reflected in the final diagnosis (both main diagnosis and secondary diagnosis) and the procedures that have been carried out during the process. maintenance. INA-CBG's codes and descriptions do not always describe a single diagnosis but can be the result of a single diagnosis or a collection of procedure diagnoses. Meanwhile, table 11 for the outpatient category also shows the results obtained, namely that there is a significant difference ($p < 0.05$) between the average real costs and INA-CBG's package rates. The research results of Nadhira *et al*, (2020) also show that there is a difference in real costs/hospital rates with INA-CBG's claims for CKD hemodialysis patients.

Conclusion

The cost of illness of CKD with hemodialysis is 75 inpatients based on the perspective of RSUD Dr. Moewardi for the July-December 2022 period is IDR. 925,012,329.00. There is a significant difference between real costs and INA-CBG's package rates for CKD patients on hemodialysis in N-4-10-II class 2 and 3, N-4-10-III class 2, N-1-12-I class 1 and 3, N-1-12-II class 1, group N-1-12-III The factors gender, age, LOS and frequency of hemodialysis had significant differences in total direct medical costs ($p < 0.05$).

Acknowledgement

Authors warmly thank to Regional Public Hospital (RSUD) Dr. Moewardi Surakarta hospital Indonesia and all parties involved and participating in this research

References

- Aditianti, A., Raswanti, I., Sudikno, S., Izwardy, D., & Irianto, S. E. (2020). Prevalensi Dan Faktor Risiko Stunting Pada Balita 24-59 Bulan Di Indonesia: Analisis Data Riset Kesehatan Dasar 2018 [Prevalence and Stunting Risk Factors In Children 24-59 Months In Indonesia: Analysis Of Basic Health Research Data 2018]. *Penelitian Gizi Dan Makanan (The Journal of Nutrition and Food Research)*, 43(2), 51-64.
- Armaya, D., Astari, A. R. N., & Asiyah, A. (2022). Manajemen Kepemimpinan Kiyai di Pondok Pesantren Dalam Membentuk Gaya Belajar Santri dan Eksistensi Lembaga di Kota Lubuk Linggau. *Insan Cendekia: Jurnal Studi Islam, Sosial dan Pendidikan*, 1(3), 58-68.
- Azalea, M., Andayani, T. M., & Satibi, S. (2016). Analisis biaya pengobatan penyakit ginjal kronis rawat inap dengan hemodialisis di rumah sakit. *Jurnal Manajemen Dan Pelayanan Farmasi (Journal of Management and Pharmacy Practice)*, 6(2), 141-150.
- Baroleh, J. M., Ratag, T. B., G, F. L. F., & Langi. (2019). Faktor-Faktor Yang Berhubungan Dengan Penyakit Ginjal Kronis Pada Pasien Di Instalasi Rawat Jalan RSUD Pancaran Kasih Manado. *Kesmas*, 8 (7), 8. <https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/27233>.
- Bello, A. K., Okpechi, I. G., Osman, M. A., Cho, Y., Htay, H., Jha, V., ... & Johnson, D. W. (2022). Epidemiology of haemodialysis outcomes. *Nature Reviews Nephrology*, 18(6), 378-395.
- Efendi H (2019). *Analisis Biaya Pasien Hipertensi Rawat Inap Di RSUD Dr. Soehadi Prijonegoro Sragen*. Universitas Setia Budi Surakarta; Thesis Master (Unpublished).
- Fauziah, F., Wahyono, D., & Budiarti, L. E. (2015). Cost of illness dari chronic kidney disease dengan tindakan hemodialisis. *Jurnal Manajemen Dan Pelayanan Farmasi (Journal of Management and Pharmacy Practice)*, 5(3), 149-158.
- Happy, A. (2018). The implementation of INA-CBGs system impact on financial performance of public hospital, the Indonesia case: a systematic review. *KnE Life Sciences*, 1-16.
- M, Sirajuddin. (2015). The Existence of Religion Norm in the Political Law Struggle in Indonesia. *Academic Research International*, 6(1), 420.
- Nadhira, R., Saputra, I., Usman, S., Bakhtiar, B., & Nurjannah, N. (2020). Comparative Analysis between Real Cost and INA-CBG's claims of Service Costs in Chronic Kidney Disease Patients with Hemodialysis. *STRADA Jurnal Ilmiah Kesehatan*, 9(2), 726-732.
- Nurwanti, R. (2018). Analisis Biaya Pengobatan Gagal Ginjal Kronik dengan Hemodialisis pada Pasien Rawat Inap di RSD Dr. Soebandi Jember Periode 2009. *Pharmauho: Jurnal Farmasi, Sains, Dan Kesehatan*, 4(1), 42-47.
- Rachmawati, E., Zahra, R. F., & Norcahyanti, I. (2019). Perbandingan Biaya Riil Terhadap Tarif INA-CBG's Tindakan Hemodialisis Pasien Gagal Ginjal Kronis Rawat Jalan di RSUD Dr. Abdoer Rahem Situbondo. *Fak Farm Univ Jember*. Published online 2019.
- Reaginta, T., Afriansyah, M. A., Ethica, S. N., & Widyana, A. R. (2022). Sosialisasi Pencegahan Penyakit Ginjal Kronik Pada Kelompok Remaja: Sebuah Kewaspadaan Dini Penyakit Ginjal. *JURNAL INOVASI DAN PENGABDIAN MASYARAKAT INDONESIA*, 1(4), 1-4.
- Roggeri, D. P., Roggeri, A., & Salomone, M. (2014). Chronic kidney disease: evolution of healthcare costs and resource consumption from predialysis to dialysis in Piedmont Region, Italy. *Advances in Nephrology*, 2014. Doi:10.1155/2014/680737.
- Saputra, W. C., WS, F. S., Advistasari, Y. D., & Munisih, S. (2020). Cost Of Illness Perawatan Pasien Gagal Ginjal Kronik Di Instalasi Rawat Inap Rsi Sultan Agung Semarang. *VISI KES: Jurnal Kesehatan Masyarakat*, 19(2).

- Serasi, R., & Hakim, M. A. R. (2019). Time Reconciliation on Fort Marlborough's Design and Functions (Penyesuaian Masa Mengenai Reka Bentuk dan Fungsi Kubu Marlborough). *Jurnal Arkeologi Malaysia*, 32(1).
- Sulistyaningrum, I. H., & Santoso, A. (2022). Analisis Perbedaan Biaya Riil dengan Tarif INA-CBG's dan Faktor Yang Mempengaruhinya untuk Chronic Kidney Disease Pada Era Jaminan Kesehatan Nasional. *Indonesian Journal of Medical and Pharmaceutical Science*, 1(1), 6-12.
- Thompson, C. B., & Panacek, E. A. (2007). Research study designs: Non-experimental. *Air medical journal*, 26(1), 18-22.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).