

## ANALYSIS OF HEMODIALYSIS SERVICE UTILIZATION BY JKN PARTICIPANTS IN THE SPECIAL REGION OF YOGYAKARTA: AN ANALYSIS OF BPJS KESEHATAN CLAIM DATA IN 2023

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### ABSTRACT

Chronic kidney disease (CKD) has become a serious global health problem with significant socio-economic implications. This study aims to analyze the determinants of the utilization of hemodialysis services for National Health Insurance (JKN) participants in the Special Region of Yogyakarta (DIY) in 2023. The study employs a cross-sectional design to analyze secondary data from the BPJS Kesehatan claim database in 2020, focusing on JKN participants receiving dialysis services at Advanced Referral Health Facilities (FKRTL). Data extraction is followed by analysis using STATA software, which includes univariate and bivariate analyses, multicollinearity and overdispersion tests, model comparison via Akaike Information Criterion (AIC), and multivariate analysis through Poisson regression and Binomial Negative methods. A total of 3,220 participants (0.089%) were enrolled in the study. The highest distribution of participants was in Sleman Regency (36.49%), followed by Bantul (29.53%), and Yogya City (25.96%). From the results of the binomial regression analysis, it was found that the age factor had a significant negative influence ( $p=0.000$ ) with a coefficient of -0.0046 and an IRR of 0.9954, which means that every increase in age by one year will decrease the frequency of visits by 0.46%. The prevalence of diabetes (3.1%) and hypertension (10.2%) which exceed the national average indicates a high risk factor for CKD in this region is high. The age factor and location of health facilities in SLEMAN Regency significantly affected the frequency, while the segment group, gender, and nursing class rights did not show significant influence.

**Keywords:** CAPD, healthcare facilities, healthcare utilization, hemodialysis, National Health Insurance

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### INTRODUCTION

Chronic kidney disease (CKD) has become a serious global health problem with significant socio-economic implications (Ritte et al., 2020). The World Health Organization (WHO) reports that CKD affects about 10% of the world's population. In Indonesia, based on Basic Health Research (RISKESDAS) in 2018, the prevalence of CKD reached 0.38% or 3.8 per 1,000 population, with the main risk factors for diabetes mellitus (1.7%) and hypertension (8.0%) (Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/MENKES/1634/2023, 2023; Riskesdas, 2018). The Global Burden of Disease Study revealed that the increase in the prevalence of CKD is consistent with substantial economic impacts in various countries (Bowe et al., 2018; Elshahat et al., 2020; Ke et al., 2022; Sundström et al., 2022; Xie et al., 2018).

The implementation of the National Health Insurance (JKN) by BPJS Kesehatan has provided universal access to hemodialysis services, which is reflected in the increase in utilization from 5.6 million outpatient visits (2019) to 6.9 million visits (2023) (BPJS Kesehatan, 2024). Although the Indonesian Case-Based Groups (INA-CBGs) payment

system has been implemented, the BPJS Kesehatan Monitoring and Evaluation Report (2023) shows that there are significant gaps in service efficiency and cost control. Badan Kebijakan Pembangunan Kesehatan (2023) through a multicenter study in 15 Indonesian provinces revealed three critical issues: significant variations in access and quality of services between regions, utilization inequality between different socio-economic groups, and inefficiencies in referral systems and service coordination.

A recent study by Putri et al. (2022) revealed that Continuous Ambulatory Peritoneal Dialysis (CAPD) is more cost-effective than Hemodialysis (HD) for CKD patients in Indonesia, with a lower total cost and Quality-Adjusted Life Years value (QALY). Despite limitations in sample size and use of utility data from other countries, these findings have important implications for the development of dialysis policies in Indonesia. However, in fact, the utilization of CAPD is still very low compared to the significant increase in the use of HD in the JKN program.

The uneven distribution of hemodialysis facilities, with 40% of facilities concentrated on the island of Java, further exacerbates the disparity in access to services (Shidieq, 2018). Kidney Disease Improving Global Outcomes (KDIGO) in its latest guidelines emphasizes the importance of a comprehensive approach in CKD management, including prevention strategies, early detection, and strengthening referral systems (KDIGO, 2024).

This study aims to analyze the determinants of the use of hemodialysis services for JKN participants in DI Yogyakarta as the basis for evaluating the dialysis service policy. The research contributes to the understanding of the factors influencing the utilization of hemodialysis services among JKN (*Jaminan Kesehatan Nasional*, Indonesia's National Health Insurance) participants in DI Yogyakarta. By identifying the determinants that affect service usage, the study provides valuable insights into patient behaviors, access to care, and potential barriers faced by individuals requiring dialysis. This analysis serves as a foundation for evaluating and improving dialysis service policies, ensuring they are aligned with the needs of patients and promoting more effective healthcare delivery within the JKN framework. Ultimately, the findings can inform policymakers and healthcare providers in their efforts to enhance the accessibility, quality, and efficiency of hemodialysis services in the region.

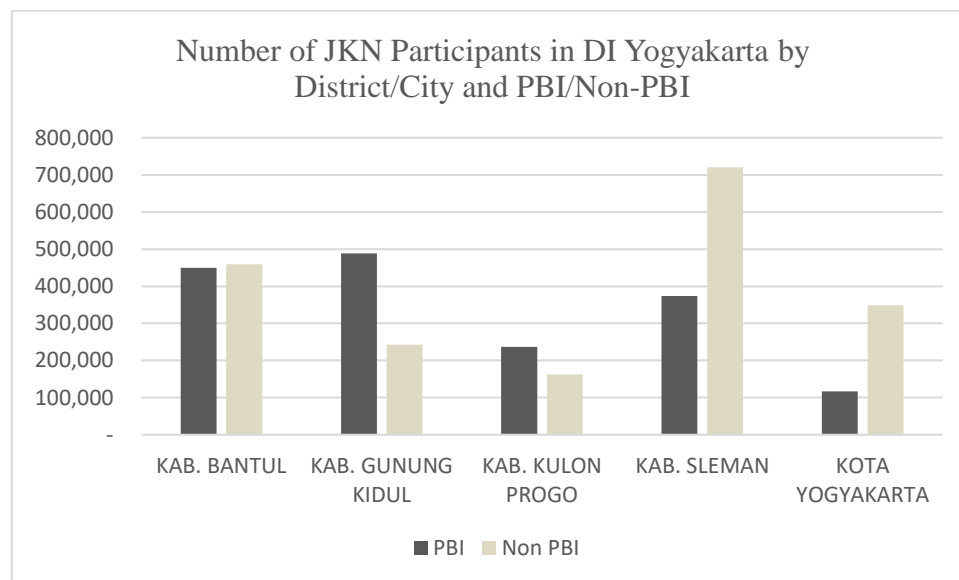
## RESEARCH METHOD

This study employs a cross-sectional design to analyze secondary data from BPJS Kesehatan claims in 2023, focusing on JKN participants receiving hemodialysis services at Advanced Referral Health Facilities (FKRTL) in DI Yogyakarta Province. The study population consists of 3,220 participants diagnosed with Chronic Kidney Disease stage 5 and undergoing hemodialysis. The dependent variable is the frequency of hemodialysis visits, with independent variables including the type of JKN membership (PBI/Non-PBI), age, gender, class rights, and health facility location. Data extraction from the BPJS Kesehatan claim database is followed by analysis using STATA software, which includes univariate and bivariate analyses, multicollinearity and overdispersion tests, model comparison via Akaike Information Criterion (AIC), and multivariate analysis through Poisson regression and Binomial Negative methods.

## RESULT AND DISCUSSION

### Characteristics of Hemodialysis Participants

This study analyzes the use of hemodialysis services in National Health Insurance (JKN) participants in the Special Region of Yogyakarta (DIY) with a total population of 3,220 hemodialysis participants out of a total of 3,598,635 JKN participants registered in 2023. The data shows a diverse distribution of participants in each district/city with different characteristics between regions.



**Figure 1.** Number of JKN Participants in DI Yogyakarta by Regency/City and PBI/Non-PBI

Sleman Regency dominated with a total of 1,093,801 JKN participants, of which non-PBI participants reached 720,339 people, almost double the PBI participants who amounted to 373,462 people. A similar pattern was seen in Yogyakarta City with 349,028 non-PBI participants and 117,083 PBI participants. Meanwhile, Bantul Regency showed a relatively balanced distribution with 449,705 PBI participants and 459,412 non-PBI participants.

Meanwhile, in Gunung Kidul, PBI participants were more dominant with 488,318 people compared to non-PBI participants who were only 242,450 people. Kulon Progo Regency has a similar pattern but with a smaller number, namely 236,211 PBI participants and 162,627 non-PBI participants.

**Table 1.** Proportion of Hemodialysis Participants

Regency/City	Freq.	Percent
Bantul Regency	951	29,53
Gunung Kidul Regency	210	6,52
The world. Kulon Progo	48	1,49
Sleman Regency	1,175	36,49
Yogyakarta City	836	25,96
<b>Total</b>	<b>3,220</b>	<b>100</b>

The total number of hemodialysis participants in DI Yogyakarta is 3,220 patients, with the largest concentration in Sleman, Bantul, and Yogyakarta City which reached 91.98% of the total patients.

**Table 2.** Proportion of Hemodialysis Participants with Registered JKN Participants

Regency / City	PBI			Non-PBI			Total		
	HD Participant	JKN Registered Participants	Proportion	HD Participant	JKN Registered Participants	Proportion	HD Participant	JKN Registered Participants	Proportion
Bantul Regency	524	449.705	0,117 %	427	459.412	0,093 %	951	909.117	0,105 %
Gunung Kidul Regency	103	488.318	0,021 %	107	242.450	0,044 %	210	730.768	0,029 %
Kulon Progo Regency	30	236.211	0,013 %	18	162.627	0,011 %	48	398.838	0,012 %
Sleman Regency	405	373.462	0,108 %	770	720.339	0,107 %	1.175	1.093.801	0,107 %
Yogyakarta City	213	117.083	0,182 %	623	349.028	0,178 %	836	466.111	0,179 %
<b>Total</b>	<b>1.275</b>	<b>1.664.779</b>	<b>0,077 %</b>	<b>1.945</b>	<b>1.933.856</b>	<b>0,101 %</b>	<b>3.220</b>	<b>3.598.635</b>	<b>0,089 %</b>

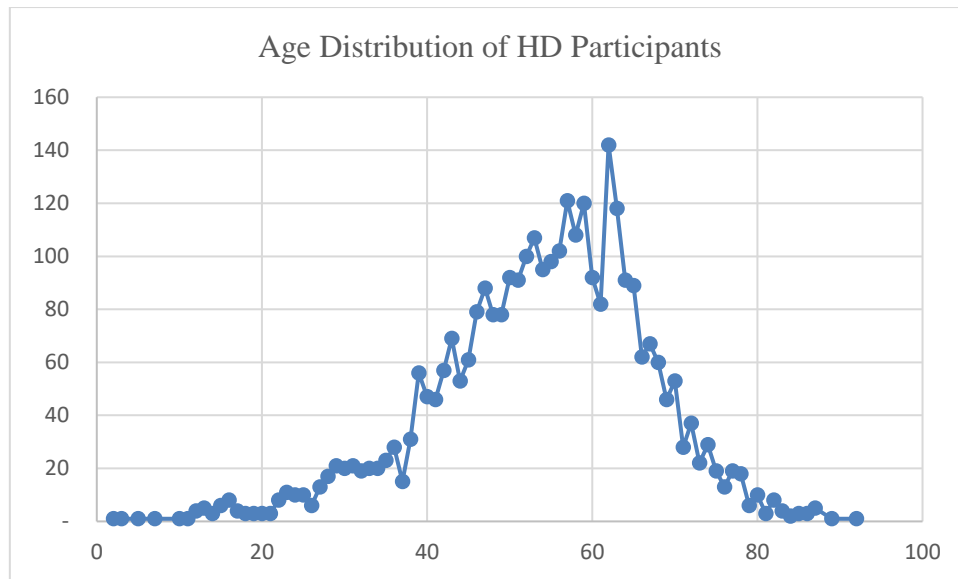
Based on data on the proportion of hemodialysis participants with JKN participants registered in Yogyakarta, it can be seen that out of a total of 3,220 hemodialysis patients, as many as 1,275 people are PBI participants (Contribution Assistance Recipients) and 1,945 people are non-PBI participants.

Yogyakarta City has the highest proportion of hemodialysis service utilization, which is 0.179% of the total registered JKN participants, followed by Bantul Regency (0.105%) and Sleman Regency (0.107%). Meanwhile, Kulon Progo Regency has the lowest proportion of 0.012%, followed by Gunung Kidul Regency at 0.029%.

Of the total 3,598,635 JKN participants in DI Yogyakarta, as many as 3,220 participants (0.089%) received hemodialysis services with an average of 61.78 visits per year (range of 1-150 visits). The highest distribution of hemodialysis participants was in Sleman Regency (36.49%), followed by Bantul (29.53%), and Yogyakarta City (25.96%).

**Table 3.** Average Hemodialysis Participant Visits

Variable	Obs	Mean	Min	Max
RJTLvisit_~t	3.220	61,78	1	150



**Figure 2.** Age Distribution of HD Participants in DI Yogyakarta

The age distribution of hemodialysis (HD) participants in DI Yogyakarta forms a normal curve pattern with an age range of 2-92 years, where the number of participants begins to increase significantly in the age of 30 and reaches its peak in the 62-year-old age group with a frequency of around 142 participants, then decreases gradually after the age of 62 years. Meanwhile, in the young age group (under 30 years old) and the elderly (over 75 years old) showed a relatively low frequency with the number of participants under 20.

### Multicollinearity Test

Based on the results of multicollinearity analysis using Variance Inflation Factor (VIF), all research variables showed no strong correlation between independent variables. This is shown by the VIF value of all variables that are far below the critical limit of 10, nursing class rights have the highest value of 2.01, followed by the segment group of 1.96, age of 1.04, district/city of 1.01, and gender of 1.00, with an average VIF value of 1.41. These results indicate that the research model meets the assumption of non-multicollinearity, so that all independent variables can be used in regression analysis without worrying about bias due to strong linear relationships between variables.

**Table 4.** Multicollinearity Test Results

Variable	VIF	1/VIF
Nursing Class Rights	2,01	0,497
Segment Groups	1,96	0,509
Age	1,04	0,958
Regency/City	1,01	0,993
Gender	1	0,998
<b>Mean VIF</b>	<b>1,41</b>	

## Poisson Regression Test

**Table 5.** Poisson Regression Test Results

Variable	Coeff.	Std. err.	with	P>z
Age	-0,0045	0,0002	-24,86	0,000
<b>Segment Groups</b>				
PBI	reff	reff	reff	reff
Non-PBI	0,0138	0,0071	-1,95	0,052
<b>Gender</b>				
Man	reff	reff	reff	reff
Woman	-0.0059	0,0045	-1.31	0,191
<b>Nursing Class Rights</b>				
Class III	reff	reff	reff	reff
Class II	0,0348	0,0082	4,26	0,000
Class I	0,0637	0,0074	8,60	0,000
<b>Regency/City</b>				
Yogyakarta City	reff	reff	reff	reff
Bantul Regency	-0,0762	0,0059	-12,76	0,000
Gunung Kidul Regency	0,0897	0,0090	9,93	0,000
The world. Kulon Progo	0,0431	0,0176	2,45	0,014
Sleman Regency	-0,3122	0,0058	-53,40	0,000
_cons	4,4688	0,0110	406,09	0,000
Prob > chi2 = 0,0000				
Pseudo R2 = 0,0384				

Based on the results of the Poisson regression test, almost all variables showed a very small p-value ( $p < 0.000$ ), which could indicate an overdispersion in the data. Overdispersion is a condition in which the variance of the data is greater than the mean, which violates the basic assumption of Poisson regression that the mean and the variance must be the same.

## Overdispersion Test

**Table 6.** Overdispersion Test Results

ystarttotal	Coeff.	Std.err.	t	P>t
muhat_RJTL	0,339	0,0057	59,90	0,000

The results of the overdispersion test showed that there was overdispersion in the data with a coefficient of 0.339 and a value of  $p < 0.000$ , which means that the variance of the data was greater than the average value. This confirms that the use of Poisson regression is less appropriate for this data, and it is better to use alternative analysis models such as Negative Binomial Regression that are more suitable for handling overdispersion conditions.

## Binomial Negative Regression Test

**Table 7.** Binomial Negative Regression Test Results

Variable	Coeff.	P>z	IRR
Age	-0,0046	0,000	0,9954
<b>Segment Groups</b>			
PBI	<i>reff</i>		
Non-PBI	0,0132	0,786	0,9869
<b>Gender</b>			
Man	<i>reff</i>		
Woman	0,0076	0,809	0,9924
<b>Nursing Class Rights</b>			
Class III	<i>reff</i>		
Class II	0,0304	0,588	1,0309
Class I	0,0629	0,216	1,0648
<b>Regency/City</b>			
Yogyakarta City	<i>reff</i>		
Bantul Regency	-0,0754	0,081	0,9273
Gunung Kidul Regency	0,0870	0,203	1,0909
The world. Kulon Progo	0,0417	0,750	1,0426
Sleman Regency	-0,3109	0,000	0,7327
Prob>chi2 = 0,0000			
Nickname	R2 =		
	0,0028		

Based on the results of the Binomial Negative regression test, it was found that the age factor had a significant negative influence ( $p=0.000$ ) on the frequency of hemodialysis visits with a coefficient of -0.0046 and an IRR of 0.9954, which means that every increase in age by one year will decrease the frequency of visits by 0.46%. For the location factor, compared to Yogyakarta City as a reference, Sleman Regency showed a significant negative influence ( $p=0.000$ ) with a coefficient of -0.3109 and an IRR of 0.7327, which indicated a decrease in the frequency of visits by 26.73%. Meanwhile, other variables such as segment group (PBI/Non-PBI), gender, nursing class rights, and other districts did not show a significant influence ( $p>0.05$ ) on the frequency of hemodialysis visits.

## Akaike Information Criterion (AIC) Value Test

**Table 8.** AIC Score Test Results

Model	N	AIC
Fish	3.220	111.743,4
Binomial Negative	3.220	32.871,39

Based on the comparison of AIC (Akaike Information Criterion) values between the Poisson model and the Binomial Negative model with the same number of samples

(N=3,220), the Binomial Negative model shows a much lower AIC value (32,871.39) compared to the Poisson model (111,743.4). This indicates that the Binomial Negative model is more suitable and better at explaining the pattern of hemodialysis visits than the Poisson model.

## **Discussion**

The analysis of the determinants of the utilization of hemodialysis services in DI Yogyakarta in 2023 revealed several important findings. The prevalence of diabetes (3.1%) and hypertension (10.2%) which exceed the national average indicates a high risk factor for CKD in this region. With these findings, it indicates the potential for an increase in the need for hemodialysis services in the future.

The negative effect of age factor (IRR=0.9954) on the frequency of hemodialysis visits is in line with the findings of Jha et al. (2013) on the characteristics of CKD in urban areas. This requires strengthening promotive-preventive efforts through community-based screening programs and the development of early detection systems.

The geographical aspect shows a significant disparity, with Sleman Regency recording a decrease of 26.73% compared to Yogyakarta City, while Gunung Kidul and Kulon Progo actually showed an increase of 9.09% and 4.26%, respectively. Tannor et al. (2018) confirmed that the geographical distribution of dialysis facilities affects patient accessibility and compliance. To overcome this gap, it is necessary to develop satellite hemodialysis units, strengthen referral systems, implement mobile hemodialysis services, and integrate telemedicine for remote patient monitoring.

Socioeconomic status, reflected in PBI/non-PBI differences (coeff: 0.0132; p=0.786) and variation in treatment classes, showed interesting patterns although not statistically significant. Agada-Amade et al. (2024) underline the persistence of the influence of socioeconomic factors on access to health services. The interventions needed include strengthening the JKN financing system, developing transportation assistance schemes, promoting CAPD as a cost-effective alternative, and empowering communities for socioeconomic support for patients.

To ensure the effectiveness of the intervention, a comprehensive monitoring and evaluation system is needed including the development of integrated PGK surveillance, periodic evaluation of programs, operational research, and strengthening collaboration with academics. Putri et al. (2022) emphasized the importance of an integrated system approach in the management of CKD in the JKN era. The implementation of these solutions requires the commitment of policy makers, strengthening the capacity of the health system, and continuous monitoring.

The transformation of the hemodialysis service system in DI Yogyakarta requires a gradual and measurable approach. The short-term focuses on optimizing existing systems, the medium term focuses on infrastructure and capacity development, and the long-term focuses on overall system transformation. The success of implementation can be measured through indicators of equal access, improved patient outcomes, financing efficiency, and service user satisfaction. Cross-sector collaborative efforts and strengthening information systems are key in realizing more effective, equitable, and sustainable hemodialysis services in Yogyakarta.



## CONCLUSION

The study found that the utilization of hemodialysis services for JKN participants in DI Yogyakarta is only 0.089%, with an average of 61.78 visits per year. Binomial Negative regression analysis indicated that age and the location of health facilities in Sleman Regency significantly influence the frequency of visits, while segment group, gender, and nursing class rights do not. Limitations of the study include its cross-sectional design, which fails to capture temporal dynamics, and the lack of comorbidity and other clinical data. Future research should adopt a longitudinal design to track changes over time and assess the impact of interventions, while also incorporating comprehensive clinical data to better understand factors affecting hemodialysis utilization. Additionally, exploring patient experiences regarding care quality and accessibility, as well as expanding the geographic scope of the research, could provide further insights for improving healthcare policies and service delivery.

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