Age and Kidney Disease Type as Key Determinants of Hemodialysis Utilization Among JKN Participants in West Java, Indonesia

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ABSTRACT
Kidney disease remains a major contributor to the burden of noncommunicable diseases in Indonesia, and hemodialysis is the primary renal replacement therapy covered under the National Health Insurance (JKN). Understanding determinants of hemodialysis utilization is essential for improving service equity and effectiveness. The objective of this study was **t**o identify determinants of hemodialysis utilization among JKN participants with kidney disease in West Java in 2022. This cross-sectional study analyzed secondary data from the BPJS Health Sample Data 2015–2022. A total of 310 respondents diagnosed with kidney disease (ICD-10 N17–N19) and residing in West Java were included. Descriptive analysis, chi-square/Fisher's exact tests, and logistic regression (backward LR) were performed to determine factors associated with hemodialysis utilization. Two variables were significantly associated with hemodialysis utilization: age and type of kidney disease. Productive-age participants had a lower risk of not receiving hemodialysis (OR = 0.329), indicating a protective effect. Participants of non-productive age with acute kidney disease had the highest probability of not receiving hemodialysis (97.7%), whereas productive-age participants with chronic kidney disease had the lowest probability (35.8%). Age and type of kidney disease are key determinants of hemodialysis utilization among JKN participants in West Java. Productive-age individuals are more likely to receive hemodialysis, while non-productive-age patients with acute kidney disease are at greatest risk of not receiving treatment.
Keywords: hemodialysis; national health insurance; kidney disease; determinants; West Java, Indonesia

INTRODUCTION
Universal Health Coverage (UHC) represents a fundamental human right, reflecting the constitutional mandate that health must be realized as a core objective of the state [1]. Target 3.8 of the *Sustainable Development Goals (SDGs)* emphasizes achieving UHC, which includes financial risk protection, access to quality essential health services, and availability of safe, effective, and affordable medicines [2]. Globally, the effective UHC coverage index increased from 45.8 in 1990 to 60.3 in 2019 on a 0–100 scale, indicating substantial progress yet still falling short of universal achievement. Indonesia, with a score of 49, is positioned in the third-lowest decile, whereas countries such as Iceland, Australia, Canada, Japan, Singapore, and South Korea occupy the highest decile with scores ranging from 87.7 to 96.3 [3].

Target 3.4 of the SDGs aims to reduce premature mortality from Noncommunicable Diseases (NCDs) by one-third by 2030. NCDs currently account for 41 million deaths annually [2,4]. Kidney diseases, as part of the NCD spectrum, contribute significantly to this burden, with an estimated 5–10 million deaths globally each year. In 2017, 697.5 million people were living with chronic kidney disease (CKD), representing a 9.1% prevalence, and 1.2 million deaths were attributed to CKD. Mortality from CKD has increased by 41.5% since 1990. Acute kidney injury affects 13.3 million individuals annually, causing up to 1.7 million deaths, with mortality rates of 23.9% in adults and 13.8% in children. These gaps between global targets and actual outcomes hinder progress toward SDG 3.4. Nearly one-third of CKD patients originate from China (132.3 million) and India (115.1 million), while Indonesia records the highest CKD burden in Southeast Asia (27.2 million) and ranks tenth among national causes of death, with more than 42,000 deaths annually [5–9]. In line with SDG and UHC advancements, monitoring NCD services and strengthening kidney disease prevention must be prioritized within global health policy [10].

As part of its UHC implementation, Indonesia operates the National Health Insurance (Jaminan Kesehatan Nasional, JKN) program, which covers catastrophic conditions including kidney disease. Hemodialysis (HD) is a renal replacement therapy that removes excess fluid, solutes, and toxins from the blood using an artificial kidney (dialyzer) connected to a hemodialysis machine. The Ministry of Health has expanded dialysis service coverage to ensure optimal patient outcomes [11–14]. HD was the most frequently performed procedure in Advanced Outpatient Services (RJTL) during 2020–2021, with 5.5 million visits [15]. There were 130,931 active HD patients and 61,786 new patients [16]. However, many patients still do not receive the recommended twice-weekly HD sessions due to shortages of trained personnel and dialysis machines. In 2018, Indonesia lacked 7,681 certified nurses and 10,492 dialysis machines, leaving approximately 20,000 patients without adequate treatment access. West Java had the highest number of HD units in 2020 and the largest number of new patients in 2018, followed by East Java and Central Java [16–18]. These gaps contribute to substantial economic burdens, as HD is a long-term, high-cost therapy for catastrophic illness [13].

West Java aims to ensure accessible HD services, achieving 98.8% data submission coverage to the *Indonesian Renal Registry (IRR)* and maintaining relatively even distribution of HD units [18]. In 2018, West Java recorded 14,796 new HD patients, and in 2020 it had 180 HD units, 1,790 nurses, and 2,837 machines [16,18]. Nevertheless, based on service standards, West Java still lacks 882 nurses and 3,137 HD machines. Many patients remain unable to receive HD twice weekly, remain on waiting lists for routine schedules, or receive treatment in facilities operating three shifts per day, conditions that may compromise HD quality and outcomes [18]. Thus, despite substantial infrastructure, West Java continues to face major challenges in ensuring quality, equitable, and efficient HD services for JKN participants with kidney disease [11–14].

International evidence shows similar disparities. In metropolitan Brazil, female sex, age 30–59 years, and income at or below two minimum wages were associated with the lowest HD access [19]. Approximately 9.2% of HD patients discontinued treatment, with women and rural residents at higher risk; Medicaid coverage in the United States was associated with lower discontinuation rates [20]. In Indonesia, HD utilization among JKN participants in 2015–2016 was influenced by participant characteristics (sex, age, membership type) and geographic region [21]. Age, sex, and residence remain the most influential determinants of HD access. Further analysis of unexplored variables and studies at smaller geographic scales are needed for more contextually relevant insights. The BPJS Health Sample Data provides substantial potential for research due to its accessibility and representativeness at national, provincial, and district/city levels [22].

Secondary data from BPJS Health, first released in 2019, aims to enhance transparency and support evidence-based policymaking. The BPJS Health Sample Data 2015–2022 includes the 2022 general sample, contextual datasets on diabetes mellitus, tuberculosis, and maternal and child

health (MCH). Since its initial release, the dataset has expanded to 82.3 million rows covering 2015–2022 [23]. Based on these data, this study aimed to examine the determinants of hemodialysis among JKN participants with kidney disease in West Java Province in 2022.

METHODS

The study was carried out using health service records from the year 2022, focusing specifically on JKN participants residing in West Java Province and accessing health services within the same region. This temporal and geographical scope was essential to ensure that the analysis reflected the most recent service utilization patterns and the contextual realities of kidney disease management in West Java. Methodologically, the research adopted a quantitative approach with a cross-sectional design. Although the analysis concentrated on service data from 2022, the dataset itself originated from the BPJS Health Sample Data 2015–2022, a longitudinal cohort database that systematically recorded participant characteristics and service utilization over an eight-year period. This allowed the study to draw upon a rich and structured secondary dataset while maintaining the analytical focus on a single year of service delivery.

The subjects of the study were JKN participants diagnosed with kidney disease coded ICD-10 N17–N19, representing acute kidney injury, chronic kidney disease, and unspecified kidney failure. The initial population consisted of 2,407,300 participants included in the BPJS Health Sample Data. Using a total sampling technique, the study identified all individuals meeting the diagnostic criteria and who either received or did not receive hemodialysis services in West Java during 2022. The inclusion criteria required that respondents be Indonesian residents registered in BPJS Health, included in the BPJS sample dataset with service records in 2022, possess complete demographic and administrative information, have a confirmed ICD-10 N17–N19 diagnosis, and reside in and access health services within West Java. Exclusion criteria removed respondents with incomplete data, inactive or deceased membership status, residence or service access outside West Java, or absence of the specified kidney disease diagnosis. After applying these criteria, the final sample consisted of 310 respondents. Data extraction was conducted by constructing a comprehensive matrix table that documented all relevant variables from the BPJS Health dataset.

The study examined a series of independent variables, including age, sex, marital status, inpatient class, participant segmentation, region of residence, ownership of advanced referral health facilities (FKRTL), FKRTL type, type of kidney disease, and comorbidities. The dependent variable was the receipt of hemodialysis services among JKN participants. Variable measurement relied entirely on the structured attributes available in the BPJS dataset. Kidney disease was identified through ICD-10 codes N17–N19, while hemodialysis receipt was determined through procedure records documented in 2022. Sociodemographic variables were measured using participant registration data, and comorbidities were identified through accompanying diagnostic codes.

Data analysis proceeded through several stages. Descriptive analysis was first conducted to portray the characteristics of the respondents. Bivariate analysis using chi-square tests, or Fisher's exact tests when assumptions were not met, was then applied to examine associations between independent variables and hemodialysis receipt. Statistical significance was determined using p-values, with $p < 0.05$ indicating a significant association. Variables demonstrating $p < 0.25$ in bivariate analysis were subsequently included in logistic regression modeling using the backward LR method to identify the most parsimonious and explanatory model. The dominant variable in the final model was determined by the smallest p-value and the largest Wald statistic.

RESULTS

The descriptive analysis presented in Table 1 shows that among the 310 JKN participants included in the study, the majority of individuals diagnosed with kidney disease received hemodialysis, accounting for 52.6% of the sample. Most respondents were of productive age (70%), male (51.9%), and married (81.6%). A large proportion accessed health services under inpatient class 3 (91.0%), were non-PBI members (81.6%), and resided in district areas (72.6%). More than half utilized services at privately owned advanced referral facilities (59.4%), and nearly half received care at Type B or Class II hospitals (45.8%). The vast majority were diagnosed with chronic kidney disease (92.3%), and 61.3% had comorbid conditions.

Table 1. Descriptive analysis of all variables

Variable	Category	Frequency	Percentage
Hemodialysis receipt	No	147	47.4
	Yes	163	52.6
Age	Productive	217	70.0
	Non-productive	93	30.0
Sex	Male	161	51.9
	Female	149	48.1
Marital status	Never married	33	10.6
	Divorced	24	7.7
	Married	253	81.6
Inpatient class	Class 1	17	5.5
	Class 2	11	3.5
	Class 3	282	91.0
Participant segmentation	PBI	57	18.4
	Non-PBI	253	81.6
Region of residence	District	225	72.6
	City	85	27.4
FKRTL ownership	Private	184	59.4
	Government	126	40.6
FKRTL type	Type D / Class IV	18	5.8
	Type C / Class III	139	44.8
	Type B / Class II	142	45.8
	Type A / Class I	11	3.5
Type of kidney disease	Acute	24	7.7
	Chronic	286	92.3
Comorbidity	No	120	38.7
	Yes	190	61.3

The results of the chi-square and Fisher's exact tests are summarized in Table 2. These analyses examined the relationship between the independent variables; age, sex, marital status, inpatient class, participant segmentation, region of residence, FKRTL ownership, FKRTL type, type of kidney disease, and comorbidities and the dependent variable, hemodialysis receipt. Three variables demonstrated statistically significant associations with hemodialysis utilization among JKN participants with kidney disease in West Java in 2022: age ($p < 0.0001$), FKRTL Type D/Class IV ($p = 0.018$), and type of kidney disease ($p < 0.0001$). Variables such as sex, marital status, inpatient class, participant segmentation, region of residence, FKRTL ownership, and comorbidities showed no significant relationship. Variables with $p < 0.25$ in bivariate analysis were included in logistic regression modeling. Four variables met this criterion: age, sex, FKRTL type, and type of kidney disease.

The logistic regression results in Table 3 indicate that age and type of kidney disease were significantly associated with hemodialysis receipt. Age emerged as the most dominant determinant, with $p < 0.0001$ and a Wald statistic of 16.779. The odds ratio for productive

age was 0.329, indicating a protective effect: after controlling for other variables, individuals of productive age had 0.329 times lower risk of not receiving hemodialysis compared with non-productive age participants.

Table 2. Chi-Square or Fisher's Exact Test Results for Hemodialysis Receipt (West Java, 2022)

Variable	Category	Hemodialysis utilization		p-value	PR	(95% CI)
		No: f (%)	Yes: f (%)			
Age	Productive	84 (38.7)	133 (61.3)	<0.0001*a	0.571	(0.459–0.711)
	Non-productive	63 (67.7)	30 (32.3)			
Sex	Male	83 (51.6)	78 (48.4)	0.161a	1.200	(0.946–1.523)
	Female	64 (43.0)	85 (57.0)			
Marital status	Never married	12 (36.4)	21 (63.6)	0.254a	0.748	(0.468–1.195)
	Divorced	12 (50.0)	12 (50.0)	1.000a	1.028	(0.676–1.565)
	Married (ref)	123 (48.6)	130 (51.4)			
Inpatient class	Class 1	8 (47.1)	9 (52.9)	1.000a	1.005	(0.598–1.690)
	Class 2	7 (63.6)	4 (36.4)	0.430a	1.360	(0.855–2.162)
	Class 3 (ref)	132 (46.8)	150 (53.2)			
Participant segmentation	PBI	31 (54.4)	26 (45.6)	0.308a	1.186	(0.903–1.558)
	Non-PBI	116 (45.8)	137 (54.2)			
Region of residence	District	109 (48.4)	116 (51.6)	0.645a	1.084	(0.825–1.423)
	City	38 (44.7)	47 (55.3)			
FKRTL ownership	Private	92 (50.0)	92 (50.0)	0.325a	1.145	(0.896–1.464)
	Government	55 (43.7)	71 (56.3)			
FKRTL type	Type D / Class IV	14 (77.8)	4 (22.2)	0.018*b	2.852	(1.053–7.722)
	Type C / Class III	79 (56.8)	60 (43.2)	0.067b	2.084	(0.785–5.529)
	Type B / Class II	51 (35.9)	91 (64.1)	0.748b	1.317	(0.489–3.543)
	Type A / Class I (ref)	3 (27.3)	8 (72.7)			
Type of kidney disease	Acute	23 (95.8)	1 (4.2)	<0.0001*a	2.210	(1.890–2.585)
	Chronic	124 (43.4)	162 (56.6)			
Comorbidity	No	57 (47.5)	63 (52.5)	1.000a	1.003	(0.788–1.275)
	Yes	90 (47.4)	100 (52.6)			

*a Chi-square test *b Fisher's exact test *p < 0.05

Table 3. Logistic regression results for hemodialysis receipt (West Java, 2022)

Variable	Category	B	Wald	p-value	Exp(B)	95% CI (Lower–Upper)
Age	Productive	-1.111	16.779	<0.0001*	0.329	0.193–0.560
	Non-productive (ref)					
Type of kidney disease	Acute	3.257	9.911	0.002*	25.975	3.419–197.348
	Chronic (ref)					
Constant	—	0.526	5.227	0.022	1.693	—

*p < 0.05

Logistic regression equation: $y = 0.526 - 1.111(\text{productive age}) + 3.257(\text{acute kidney disease})$

Probability formula: $p = \frac{1}{1+\exp(-y)}$

Table 4 presents the predicted probabilities of not receiving hemodialysis under different combinations of age and kidney disease type. Participants of non-productive age with acute kidney disease had the highest probability of not receiving hemodialysis (97.7%), whereas productive-age participants with chronic kidney disease had the lowest probability (35.8%). These findings confirm that age and type of kidney disease are the key determinants of hemodialysis receipt among JKN participants in West Java.

Table 4. Probability of not receiving hemodialysis among JKN participants

Condition	Age	Type of kidney disease	Probability
1	Productive	Acute	93.5%
2	Productive	Chronic	35.8%
3	Non-productive	Acute	97.7%
4	Non-productive	Chronic	62.9%

DISCUSSION

This study shows that in 2022, the majority of JKN participants with kidney disease in West Java received hemodialysis services, exceeding the proportion of those who did not receive such treatment [25,26]. This finding aligns with previous research indicating that health insurance increases access to healthcare utilization [25,26]. As a universal health insurance scheme, JKN provides broad access to healthcare services with high utilization rates, covering all individuals regardless of social or economic status [26].

Patients of productive age (15–60 years) were more frequently diagnosed with kidney disease in West Java in 2022. In contrast, data from the Centers for Disease Control and Prevention (CDC) indicate that chronic kidney disease is more common among individuals aged 65 years or older compared with those aged 45–64 years or 18–44 years [27]. Several risk factors may contribute to chronic kidney disease among individuals younger than 50 years, including dietary behaviors (such as consuming energy supplement drinks more than four times per week), smoking ten

or more cigarettes per day, and consuming herbal medicines more than four times per week, even after adjusting for hypertension and urinary tract stone history [28].

In this study, age was significantly associated with hemodialysis receipt based on both chi-square/Fisher's tests and logistic regression analysis. Productive age was found to be a protective factor, with individuals in this age group having a 0.329-fold lower risk of not receiving hemodialysis compared with non-productive age participants in West Java in 2022. This result is consistent with research showing that hemodialysis utilization among BPJS Health patients in 2015–2016 was influenced by age [21]. Hemodialysis among productive-age individuals may be related to the high workload during this life stage, which directly affects health [29]. Individuals aged over 80 years (non-productive age) often face barriers to accessing outpatient services. Limited health literacy and attention to personal health frequently lead to delayed treatment and increased healthcare costs [30]. Most older adults are unemployed and have limited income, making them vulnerable to rising living costs, including doctor fees, transportation, medications, and medical procedures [31]. Economic constraints also influence referrals to healthcare facilities, as older adults with financial limitations often hesitate to seek referrals [32].

From the perspective of health-seeking behavior theory, individuals of productive age tend to be more proactive in seeking healthcare services due to their awareness of the importance of health for maintaining employment and fulfilling family responsibilities. Health-seeking behavior is influenced by knowledge, attitudes, beliefs, and personal values regarding health. Additionally, previous illness experiences may motivate individuals to seek healthcare more actively [33]. However, another study reported that the lowest access to hemodialysis services occurred among individuals aged 30–59 years, despite this age group representing the majority of hemodialysis users. This may be due to their strong involvement in the labor market, making it difficult to leave work for weekly healthcare visits without risking job loss [19].

In this study, most male participants experienced kidney disease. However, previous research indicates that chronic kidney disease is more common among women, although the prevalence of end-stage renal disease and receipt of renal replacement therapy is higher among men. These differences may be attributed to physiological and social/structural risk factors influencing kidney disease progression, such as varying distributions of hypertension and obesity between men and women [34]. Men exhibit faster declines in kidney function, more frequent kidney failure, and higher mortality and cardiovascular risk compared with women [35]. In this study, sex was not associated with hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. This finding is consistent with research conducted at the Surgical Polyclinic of RSUD H. Padjonga Dg. Ngalle, Takalar District, which found that sex was not associated with healthcare utilization. Both men and women had equal likelihood of utilizing healthcare services, although local behaviors or cultural habits may influence whether individuals seek care [36]. A study in Texas also found no significant sex differences among patients accessing emergency departments for hemodialysis, regardless of insurance status [37].

This study does not align with previous findings indicating that sex significantly influences hemodialysis receipt. Hemodialysis utilization among BPJS Health patients in 2015–2016 was influenced by sex, with women being more likely to utilize hemodialysis [21]. Women tend to have higher disease incidence, more available time for healthcare visits, and greater responsiveness to health information, which may influence their healthcare utilization [38].

In this study, many JKN participants diagnosed with kidney disease were married. This finding is consistent with research showing that chronic kidney disease is more prevalent among married individuals [39,40]. Family responsibilities are closely related to higher levels of busyness and financial obligations, which may contribute to unhealthy lifestyles and accelerate the development of diseases such as chronic kidney disease, often caused by diabetes mellitus and hypertension [39]. However, marital status was not associated with hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. Marital status does not necessarily influence healthcare utilization, as other factors such as individual mindset and beliefs about healthcare services may play a more significant role [41]. This finding aligns with research showing that marital status is not statistically associated with healthcare utilization. Married individuals often prioritize basic needs over healthcare, and insufficient household income may discourage healthcare utilization [42].

This study does not align with research indicating that marital status is statistically associated with healthcare utilization, where married and widowed individuals were more likely to utilize healthcare services [43]. Spouses may provide physical and emotional support, including accompanying their partners to healthcare facilities for consultations or treatment [44]. Marriage may serve as a source of support that encourages adherence to hemodialysis programs [45].

In this study, most JKN participants with kidney disease utilized inpatient class 3 services. This finding is consistent with research showing that most chronic kidney disease patients are treated in class 3 inpatient wards [46]. Patients undergoing hemodialysis often face challenges such as premium arrears, dissatisfaction with premium amounts, and desires to downgrade their inpatient class [47]. This study found no association between inpatient class and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. Differences in inpatient class do not affect access to medical services such as hemodialysis and medications; only the inpatient room category differs [48].

This study does not align with research indicating that health insurance type (categorized by class) influences healthcare resource utilization in Korea. Patients in the Medical Aid (MA) group, a government-subsidized public assistance program, and Class I patients (with minimal or no copayments) were more likely to be hospitalized compared with those in the Health Insurance (HI) group, a wage-based insurance program, due to lower or eliminated copayments. Individuals with lower socioeconomic status also tend to have poorer health and greater vulnerability to disease [49].

In this study, most JKN participants diagnosed with kidney disease belonged to the non-PBI segment. Both PBI and non-PBI participants utilize JKN services; however, non-PBI utilization is higher, as PBPU groups are generally dominated by individuals with high health risks, particularly chronic and catastrophic illnesses [50]. This study found no association between participant segmentation and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. This finding aligns with research showing no association between BPJS membership type and healthcare utilization in the working area of Puskesmas Pegandon [51]. Differences in BPJS segmentation, including PBI and non-PBI categories and inpatient classes 1, 2, and 3, do not result in differences in receiving medical services, including hemodialysis [48].

This study does not align with research indicating that hemodialysis utilization is influenced by membership type, with PBPU (non-PBI) participants being more likely to utilize hemodialysis [21]. Healthcare utilization is typically higher among non-PBI groups because they are more aware of JKN benefits and may use them to maintain healthy lifestyles [52].

In this study, most kidney disease patients in West Java resided in district areas. This finding is consistent with research showing that chronic kidney disease prevalence is higher in rural areas than in urban areas, associated with lower awareness of chronic kidney disease and its risk factors [53,54]. However, this study found no association between region of residence and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. Communities tend to utilize comprehensive and affordable or free healthcare services through BPJS, and despite geographic challenges, individuals will still seek care when necessary [55].

This study does not align with research indicating that geographic region influences hemodialysis utilization [21]. The geographic location of dialysis centers and limited dialysis machines are major barriers to adequate dialysis access, causing many patients to undergo fewer weekly dialysis sessions than recommended due to distance and associated costs [56].

In this study, most JKN participants with kidney disease utilized services at privately owned FKRTL facilities. Follow-up with nephrologists, weekly dialysis frequency, and erythropoietin supplementation were significantly higher among patients treated in private hospitals [57]. This study found no association between FKRTL ownership and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. This finding aligns with research showing that BPJS Health increases healthcare utilization in both private and government facilities compared with facilities not partnered with BPJS [58]. No bias in chronic kidney disease patient management was observed between government and private hospitals, although available facilities may vary [57].

This study does not align with research indicating that facility ownership affects health outcomes and healthcare utilization, where older age, higher education, and greater wealth were associated with greater use of private outpatient services [59].

In this study, most JKN participants with kidney disease utilized services at Type B or Class II hospitals. This finding is consistent with research conducted at RSU Haji Surabaya, a Type B teaching hospital that serves as a primary referral destination due to adequate facilities, advanced medical equipment, and senior specialist physicians, thereby satisfying JKN participants [60]. Logistic regression analysis in this study showed no association between FKRTL type and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. However, chi-square/Fisher's tests indicated an association, where JKN participants at Type D or Class IV facilities had a 2.852-fold higher risk of not receiving hemodialysis compared with those at Type A or Class I facilities.

FKRTL facilities can be classified based on accreditation status: Class A hospitals have comprehensive facilities and broad medical and subspecialty services; Class B hospitals have medical services and at least 11 specialists with limited subspecialties; Class C hospitals provide essential specialist services; and Class D hospitals offer basic medical services [61]. This study aligns with research showing that hospital facilities and physician services are associated with healthcare utilization at the general polyclinic of Islamic Hospital Surabaya-A. Yani [62]. The number and reliability of healthcare workers, completeness of facilities, guaranteed types of services, and availability of medications increase interest in utilizing healthcare services. Facilities, service types, and specialist availability strengthen service development [63]. Hospitals with comprehensive services support integrated hemodialysis care planning [64].

In this study, most JKN participants in West Java had chronic kidney disease. This finding is consistent with research showing that many patients have underlying chronic kidney disease, and some also experience acute kidney injury [65]. This study found that type of kidney disease was associated with hemodialysis receipt among JKN participants with kidney disease in West Java in 2022, where participants with acute kidney disease had a 25.975-fold higher risk of not receiving hemodialysis compared with those with chronic kidney disease. Patients with chronic kidney disease rely heavily on hemodialysis to replace kidney function [66]. This finding aligns with research showing that chronic diseases are statistically associated with healthcare utilization [43]. Strong predictors of broad healthcare utilization include the number and pattern of chronic diseases [67,68]. Hemodialysis utilization among chronic kidney disease patients helps them survive and improves their quality of life [69]. No hemodialysis patients became inactive BPJS participants because chronic kidney disease patients understand the lifelong importance of hemodialysis and rely on JKN for guaranteed hemodialysis services [47].

In this study, most JKN participants diagnosed with kidney disease had comorbidities. This finding aligns with research showing that chronic kidney disease is associated with extreme comorbidity across various mental and physical conditions, including hypertension, coronary heart disease, and diabetes [70]. However, this study found no association between comorbidities and hemodialysis receipt among JKN participants with kidney disease in West Java in 2022. Hemodialysis does not remove all toxins from the body, potentially contributing to comorbidities that negatively affect patients' lives [71]. This finding aligns with research showing no significant association between comorbidities and self-care behavior among patients. Factors influencing this include patients' experience managing their conditions and better health status among those without comorbidities [72].

This study does not align with research indicating that greater comorbidity is associated with higher healthcare utilization [73]. Another study found that comorbidities were associated with perceived quality of hemodialysis services, where comorbidities significantly influenced patients' perceptions of hemodialysis quality [74].

A limitation of this study is that the use of secondary data restricted the available research variables, suggesting the need for further exploration of variables such as health screening status, occupation, or education. Some variables lacked complete data, such as kidney disease stage and specific FKRTL types. As a result, this study could not fully explore hemodialysis utilization because it could not determine whether participants with kidney disease had appropriate referrals for hemodialysis.

CONCLUSION

The study concludes that age and type of kidney disease are the primary determinants of hemodialysis utilization among JKN participants in West Java in 2022. Productive-age individuals were significantly more likely to receive hemodialysis, while non-productive-age participants with acute kidney disease had the highest probability of not receiving treatment. These findings highlight the need for BPJS Health to refine hemodialysis benefit policies by considering age, FKRTL type, and kidney disease type, and to improve the completeness of sample data for future policy development.

Ethical consideration, competing interest and source of funding

-Ethical considerations were rigorously upheld throughout the study. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Negeri Semarang, under approval number 352/KEPK/FK/KLE/2024. Participant confidentiality was strictly protected; personal identifiers were anonymized using participant numbers, and no individual-level data were disclosed. The study adhered to all ethical standards for secondary data analysis, ensuring the security and integrity of participant information.
-There is no conflict of interest related to this research.
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REFERENCES

1. DPR RI. Undang-Undang Republik Indonesia Nomor 17 Tahun 2023 tentang kesehatan. Undang-Undang. 2023;(187315):1–300.

2. United Nations. Transforming our world: the 2030 agenda for sustainable development. The General Assembly Adopts. 2015.
3. GBD 2019 Universal Health Coverage Collaborators. Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020;396(10258):1250–84.
4. WHO. SDG target 3.4 non-communicable diseases and mental health [Internet]. 2024 [cited 2024 Jun 23]. Available from: https://www.who.int/data/gho/data/themes/topics/sdg-target-3_4-noncommunicable-diseases-and-mental-health (who.int in Bing)
5. GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2020;395(10225):709–33.
6. Kemenkes RI. Waspada penyakit ginjal, kenali ciri dan cara pencegahan [Internet]. 2022 [cited 2024 Nov 14]. Available from: https://kemkes.go.id/id/waspada-penyakit-ginjal-kenali-ciri-dan-cara-pencegahan
7. Kidney Disease: Improving Global Outcomes (KDIGO). Global burden of AKI. 2019.
8. Kung CW, Chou YH. Acute kidney disease: an overview of the epidemiology, pathophysiology, and management. Kidney Res Clin Pract. 2023;42(6):686–99.
9. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. Bull World Health Organ. 2018;96(6):414–22.
10. Li PKT, Garcia-Garcia G, Lui SF, Andreoli S, Fung WWS, Hradsky A, et al. Kidney health for everyone everywhere: from prevention to detection and equitable access to care. Can J Kidney Heal Dis. 2020;7(1):202-8.
11. Kemenkes RI. Peraturan Menteri Kesehatan Republik Indonesia Nomor 8 Tahun 2022 tentang perubahan atas Peraturan Menteri Kesehatan Nomor 14 Tahun 2021 tentang standar kegiatan usaha dan produk pada penyelenggaraan perizinan berusaha berbasis risiko sektor kesehatan. Jakarta: Kemenkes RI; 2022.
12. Kemenkes RI. Keputusan Menteri Kesehatan RI Nomor HK.01.07/Menkes/1634/2023 tentang pedoman nasional pelayanan kedokteran tata laksana ginjal kronik. Jakarta: Kemenkes RI; 2023.
13. Kemenkes RI. Optimizing dialysis care in dialysis units [Internet]. lms.kemkes.go.id. 2024 [cited 2024 Jun 23]. Available from: https://lms.kemkes.go.id/courses/802bb9d8-35fe-4f2e-9597-cef15e03bae3
14. Kemenkes RI. Pemerintah upayakan universal health coverage bagi masyarakat Indonesia [Internet]. 2021 [cited 2024 Jun 23]. Available from: https://sehatnegeriku.kemkes.go.id/baca/umum/20201212/0135971/pemerintah-upayakan-universal-health-coverage-bagi-masyarakat-indonesia/
15. DJSN. Statistik JKN 2016–2021. Dewan Jaminan Sosial Nasional. 2022;1–252.
16. PENEFRI. 13th annual report of Indonesian Renal Registry 2020. 2020;1–37.
17. Fitrianeti D, Dominata A. Implementasi Permenkes Nomor 812 Tahun 2010 tentang tata laksana penyelenggaraan pelayanan hemodialisis di Indonesia. J Penelit Pengemb Pelayanan Kesehat. 2021;5(1):1–19.
18. Liu MW, Syukri M, Abdullah A, Chien LY. Missing in-center hemodialysis sessions among patients with end stage renal disease in Banda Aceh, Indonesia. International journal of environmental research and public health. 2021 Aug 31;18(17):9215.
19. Soares ACO, Cattafesta M, Paixão MPCP, Neto ET dos S, Salaroli LB. Determinants of access to hemodialysis services in a metropolitan region of Brazil. BMC Public Health. 2022;8(2):1–16.
20. Wetmore JB, Gilbertson DT. Nephrology factors associated with elective withdrawal of maintenance hemodialysis: A case-control analysis. 2020;55415:227–36.
21. Fitrilia I, Rahmawati DA, Widiar RP. Analisis Retrospektif Pemanfaatan Hemodialisis pada Awal Implementasi Kebijakan JKN di Indonesia. Jurnal Ventilator. 2026 Jun 23;4(2):363-75.
22. BPJS Kesehatan. Data sampel BPJS Kesehatan 2015–2021. Jakarta: BPJS Kesehatan; 2022.
23. BPJS Kesehatan. Peluncuran data sampel BPJS Kesehatan 2023 (2015–2022). Jakarta: BPJS Kesehatan; 2023.
24. BPJS Kesehatan. Data sampel BPJS Kesehatan tahun 2023 (2015–2022). Jakarta: BPJS Kesehatan; 2023.
25. Shami E, Tabrizi JS, Nosratnejad S. The effect of health insurance on the utilization of health services: a systematic review and meta-analysis. Galen Med J. 2019;8:1411.
26. Sarkodie AO. Effect of the National Health Insurance Scheme on healthcare utilization and out-of-pocket payment: evidence from GLSS 7. Humanit Soc Sci Commun. 2021;8(1):1–10.
27. CDC. Chronic kidney disease in the United States, 2023. Adv Surg Med Spec. 2023;(May):167–82.
28. Ariyanto A, Hadisaputro S, Lestariningsih L, Adi MS. Beberapa faktor risiko kejadian penyakit ginjal kronik (PGK) stadium V pada kelompok usia kurang dari 50 tahun. J Epidemiol Kesehat Komunitas. 2018;3(1):1-8.
29. Sulistianingrum R, Yulanda NA, Mita M, Maulana MA, Budiharto I. Hubungan dukungan keluarga dan tingkat harapan pasien penyakit ginjal kronis yang menjalani hemodialisis. Mahesa Malahayati Heal Student J. 2023;3(6):1531–45.
30. Azar NS, Kamal SHM, Sajadi H, Harouni GRG, Karimi S, Foroozan AS. Barriers and facilitators of the outpatient health service use by the elderly. Iran J Ageing. 2020;15(4):258–77.
31. Safari F, Nikravan A, Ghalandari B. The effect of socioeconomic factors and unmet needs on outpatient services in Iran. J Heal Adm. 2019;22(1):91–102.
32. Madyaningrum E, Chuang YC, Chuang KY. Factors associated with the use of outpatient services among the elderly in Indonesia. BMC Health Serv Res. 2018;18(1):707-12.
33. Chien SY, Chuang MC, Chen IP. Why people do not attend health screenings: factors that influence willingness to participate in health screenings for chronic diseases. International journal of environmental research and public health. 2020 May;17(10):3495.
34. García GG, Iyengar A, Kaze F, Kierans C, Padilla-Altamira C, Luyckx VA. Sex and gender differences in chronic kidney disease and access to care around the globe. 2022;101–13.
35. Chesnaye NC, Carrero JJ, Hecking M. Differences in the epidemiology, management and outcomes of kidney disease in men and women. Nat Rev Nephrol. 2024;7–20.
36. Ekawati S, Darmawansyah D, Marzuki DS. Faktor yang berhubungan dengan pemanfaatan pelayanan RSUD H. Padjonga Dg. Ngalle Takalar. Hasanuddin J Public Heal. 2022;3(2):115–24.
37. West J, Chan HK, Molony DA, Robinson DJ, Foringer JR, Wang HE. Insurance status and emergency department visits associated with hemodialysis in Texas. JAMA Netw Open. 2020;3(2):1–5.

38. Sukeni Y, Najmah N, Idris H. Determinan pemanfaatan Jaminan Kesehatan Nasional (JKN) pada fasilitas kesehatan di masa pandemi COVID-19. Med Kartika J Kedokt Kesehat. 2021;4(4):433–46.
39. Hartini S. Gambaran karakteristik pasien gagal ginjal kronis yang menjalani hemodialisa di RSUD dr. Moewardi. J Keperawatan. 2016;2(1):1–15.
40. Arifa SI, Azam M, Woro O, Handayani K. Ginjal kronik pada penderita hipertensi di Indonesia. J MKMI. 2022;13(4):319–28.
41. Yunizar A, Nasution NH. Faktor-faktor yang berhubungan dengan pemanfaatan BPJS di Desa Pargarutan Tonga Kecamatan Angkola Timur tahun 2019. 2020;5(1):61–70.
42. Stiyawan Y, Ainy A. Pemanfaatan layanan kesehatan peserta Jaminan Kesehatan Nasional di Kecamatan Jejawi. J Manaj Kesehat Yayasan RS Dr Soetomo. 2023;9(1):163.
43. Workie SB, Mekonen N, Michael MW, Molla G, Abrha S, Zema Z, et al. Modern health service utilization and associated factors among adults in Southern Ethiopia. J Environ Public Health. 2021;2021:5–11.
44. Wulandari RD, Laksono AD, Mubasyiroh R, Rachmalina R, Ipa M, Rohmah N. Hospital utilization among urban poor in Indonesia in 2018: is government-run insurance effective? BMC Public Health. 2023;23(1):232-8.
45. Susantri W, Bayhakki B, Woferst R. Hubungan kepatuhan menjalani terapi hemodialisis dengan kualitas hidup pasien penyakit ginjal kronik di masa pandemi COVID-19. Holist Nurs Heal Sci. 2022;5(2):216–25.
46. Nadhira R, Saputra I, Usman S, Bakhtiar B, Nurjannah N. Comparative analysis between real cost and INA-CBG's claims of service costs in chronic kidney disease patients with hemodialysis. Str J Ilm Kesehat. 2020;9(2):726–32.
47. Andreastra AP, Nayoan CR, Littik SKA. Evaluation the impact of health insurance policies on the amount of informal sector payments for hemodialysis services. J Pemikir Penelit Adm Sos Hum Kebijak Publik. 2024;7:41–50.
48. Nurvidyaning SE, Sanjaya KE, Anggraeni HY. Legal review of standard inpatient class policy in Indonesia's National Health Insurance System. Research Horizon. 2025 Jun 30;5(3):807-16.
49. Suh HS, Kang HY, Kim J, Shin E. Effect of health insurance type on health care utilization in patients with hypertension: a national health insurance database study in Korea. BMC Health Services Research. 2014 Nov 21;14(1):570-8.
50. Nizar Shihab A, Nurdin A, Kadir A, Paturusi I. National health insurance effects on inpatient utilization in Indonesia. Int J Heal Sci Res. 2017;7(4):96-102.
51. Mustafidah M, Indrawati F. Pemanfaatan layanan kesehatan pada peserta BPJS Kesehatan. Higeia J Public Heal Res Dev. 2021;5(1):265–75.
52. Astuti D, Kongsin S, Hearnden SR. Utilization of primary health care under National Health Insurance in Samarinda Municipality, East Kalimantan Province, Indonesia. 2024;1025–39.
53. Kaze FF, Meto DT, Halle MP, Ngogang J, Kengne AP. Prevalence and determinants of chronic kidney disease in rural and urban Cameroonians: a cross-sectional study. BMC Nephrol. 2015;16(1):162-8.
54. Wu YL, Wu YC, Akhmetzhanov AR, Wu MY, Lin YF, Lin CC. Urban-rural health disparity among patients with chronic kidney disease: a cross-sectional community-based study from 2012 to 2019. BMJ Open. 2024;14(7):e082959.
55. Widiyastuty F, Suryawati C, Arso SP. Pemanfaatan pelayanan puskesmas oleh masyarakat di daerah perbatasan Kecamatan Entikong. J Manaj Kesehat Indones. 2023;11(1):64–78.
56. Boateng EA, Iddrisu AA, Kyei-dompim J, Amooba PA. A qualitative study on the lived experiences of individuals with end-stage kidney disease accessing haemodialysis in Northern Ghana. 2024;1(1):1–9.
57. Gowda A, Dutt AR, Bangera S. Does selection and management of patients with chronic kidney disease in government-run and private hospitals differ? J Clin Diagn Res. 2017;11(8):OC25–8.
58. Djunawan A, Lillah AI, Dewi RS. Pemanfaatan fasilitas pelayanan kesehatan primer di area perkotaan berdasarkan status ekonomi dan kepemilikan jaminan kesehatan. Media Kesehat Masy Indones. 2022;21(4):224–37.
59. Herrera CA, Rada G, Kuhn-Barrientos L, Barrios X. Does ownership matter? An overview of systematic reviews of the performance of private for-profit, private not-for-profit and public healthcare providers. PloS one. 2014 Dec 1;9(12):e93456.
60. Sabrina Q. Pelaksanaan program Jaminan Kesehatan Nasional (JKN) dalam peningkatan kualitas pelayanan kesehatan di RSU Haji Surabaya. Kebijak Manaj Publik. 2015;3(2):54–62.
61. Sungkono KR, Sarno R. Determine types of Indonesian hospital by criteria-based process model, K-means cluster, and hierarchical average linkage. 2019;8(2):191–5.
62. Hapsari YEP, Santy WH, Satriya W. The relationship of hospital facilities and physician service with health service utilization on poli general in the Hospital Islam Surabaya. J Int Heal Conf. 2019;1(1):1–7.
63. Anggita T, Suryoputro A, Sugiarto Y. Factors associated with the utilization of healthcare facility among the elderly in X Hospital Semarang. 2021;6(1269):692-8.
64. Dahliana A, Santosa WN, Rasyidah UM. Analisis kelayakan pengembangan unit hemodialisis di Rumah Sakit X di Surabaya. Keluwih J Kesehat Kedokt. 2022;3(1):93–9.
65. Malleshappa P, Shah B. Prevalence of chronic kidney disease and the incidence of acute kidney injury in patients with coronary artery disease in Mumbai, India. Heart Views. 2015;16(2):47-52.
66. Winarti R, Aini DN, Susilo J. Faktor yang berhubungan dengan kepatuhan pasien gagal ginjal kronik yang menjalani hemodialisa di RSUD Tugurejo Semarang. J Ners Widya Husada. 2018;1(1)1–13.
67. Hopman P, Heins MJ, Korevaar JC, Rijken M, Schellevis FG. Health care utilization of patients with multiple chronic diseases in the Netherlands: differences and underlying factors. Eur J Intern Med. 2016;35(1):44–50.
68. Beletsioti C, Niakas D. Health services utilization and its determinants in the context of recession: evidence from Greece. 2020;44(2):332–41.
69. Darsini, Cahyono EA. Kualitas hidup pasien hemodialisis selama pandemi COVID-19: studi kasus di ruang hemodialisa, Rumah Sakit Gatoel Kota Mojokerto. J Keperawatan. 2023;8(2):26–46.
70. MacRae C, Mercer SW, Guthrie B, Henderson D. Comorbidity in chronic kidney disease: a large cross-sectional study of prevalence in Scottish primary care. Br J Gen Pract. 2021;71(704):E243–9.
71. Utami MPS, Rosa EM, Khoiriyati A. Gambaran komorbid pasien hemodialisa. Indones J Nutr Epidemiol Reprod. 2017;8(2):82-8.
72. Adiana IN, Maha Putra INA. Hubungan antara tingkat pendidikan dan komorbiditas dengan perilaku perawatan diri pasien PPOK. J Ris Kesehat Nas. 2023;7(1):72–7.

73. Gruneir A, Griffith LE, Fisher K, Panjwani D, Gandhi S, Sheng L, et al. Increasing comorbidity and health services utilization in older adults with prior stroke. Neurology. 2016;87(20):2091–8.
74. Onsongo L, Bscn DN, Rn GG. Determinants of quality of hemodialysis services in selected county dialysis centers in Nyanza Region, Kenya. 2023;6(9):299–313.