Association Between Social Determinants of Health and Disease Awareness among Patients with Chronic Kidney Disease in Banten, Indonesia[*]

Endah Dwi Kurniawati, RN, MNS[1], Aurawamon Sriyuktasuth, RN, DSN[1], Warunee Phligbua, RN, PhD[1]

Abstract

Purpose: To assess awareness of chronic kidney disease and examine the association between social determinants of health and disease awareness among patients with chronic kidney disease in Banten Province, Indonesia.

Design: Predictive correlational study.

Methods: Convenience sampling was used to recruit 137 patients with chronic kidney disease in stage 2 and 3 who had received regular treatment at the general hospital in Banten, Indonesia. The data were collected by questionnaires including personal information form, Indonesia's Health Literacy Short-Form Survey Questionnaire, and Communication Assessment Tool. Descriptive statistics, Chi-square test, and binary logistic regression were performed for statistical analysis.

Main findings: Results indicated that 67.9% of the participants were unaware of their kidney disease. In binary logistic regression analysis, individuals with a high school (OR = 5.26, 95%CI [1.06, 25.90]), or higher education (OR = 16.49, 95%CI [2.77, 97.96]), sufficient health literacy (OR = 4.97, 95%CI [1.42, 17.37]), and more than six healthcare visits in the past 12 months (OR = 3.31, 95%CI [1.13, 9.67]) demonstrated higher awareness than the reference group.

Conclusion and recommendations: Based on the study results, nurses and healthcare professionals should pay greater attention to patients with low education, limited health literacy, and infrequent healthcare visits. Effective health-literacy-based interventions should be provided to ensure that the patients recognize their disease status, understand health information, and manage the disease properly to slow kidney disease progression. In addition, future research should be done in other settings, and other social determinants of health should be explored.

Keywords: disease awareness, chronic kidney disease, social determinants of health

ความสัมพันธ์ระหว่างปัจจัยสังคมกำหนดสุขภาพและความตระหนักรู้เกี่ยวกับโรคในผู้ป่วยไตเรื้อรัง ในเมืองบันเทน ประเทศอินโดนีเซีย*

Endah Dwi Kurniawati, พย.ม.[1] อรวมน ศรียุกตศุทธ, DSN[1], วารุณี พลิกบัว, PhD[1]

บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาความตระหนักรู้การเป็นโรคไตเรื้อรัง และความสัมพันธ์ระหว่างปัจจัยสังคมกำหนดสุขภาพและความตระหนักรู้การเป็นโรคไตเรื้อรัง ในผู้ป่วยโรคไตเรื้อรัง ในเมืองบันเทน ประเทศอินโดนีเซีย

รูปแบบการวิจัย: การศึกษาความสัมพันธ์เชิงทำนาย

วิธีดำเนินการวิจัย: ใช้วิธีการสุ่มตัวอย่างแบบสะดวกในการคัดเลือกผู้ป่วยโรคไตเรื้อรังในระยะที่ 2 และ 3 จำนวน 137 คน ที่มารับการรักษาจากโรงพยาบาลทั่วไปประจำเมืองบันเทน ประเทศอินโดนีเซีย เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามความรอบรู้ด้านสุขภาพฉบับสั้น และแบบสอบถามการประเมินการสื่อสาร วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา สถิติไคสแควร์ และการวิเคราะห์ถดถอยโลจิสติกทวิ

ผลการวิจัย: กลุ่มตัวอย่างร้อยละ 67.9 ไม่ได้ตระหนักว่าตนเองมีความเจ็บป่วยด้วยโรคไตเรื้อรัง ผลการวิเคราะห์ถดถอยโลจิสติกทวิพบว่า กลุ่มตัวอย่างที่มีการศึกษาระดับมัธยมศึกษา (OR = 5.26, 95%CI [1.06, 25.90]) หรือระดับมหาวิทยาลัย (OR = 16.49, 95%CI [2.77, 97.96]) มีความรอบรู้ด้านสุขภาพเพียงพอ (OR = 4.97, 95%CI [1.42, 17.37]) และมีการเข้ารับบริการสุขภาพมากกว่า 6 ครั้ง ในรอบ 12 เดือนที่ผ่านมา (OR = 3.31, 95%CI [1.13, 9.67]) มีความตระหนักรู้ถึงการเจ็บป่วยด้วยโรคไตเรื้อรังมากกว่ากลุ่มอ้างอิง

สรุปและข้อเสนอแนะ: จากผลการศึกษาครั้งนี้ พยาบาลและบุคลากรสุขภาพควรให้ความสนใจกับผู้ป่วยที่มีระดับการศึกษาต่ำ มีความรอบรู้ด้านสุขภาพไม่เพียงพอ และมารับการบริการสุขภาพน้อยครั้ง ควรใช้วิธีการที่มีประสิทธิภาพโดยเน้นการส่งเสริมความรอบรู้ด้านสุขภาพ ช่วยให้ผู้ป่วยตระหนักถึงความเจ็บป่วยด้วยโรคไตเรื้อรัง และจัดการโรคได้อย่างเหมาะสมเพื่อชะลอความเสื่อมของไต นอกจากนั้นควรทำการศึกษาวิจัยเพิ่มเติมในสถานพยาบาลอื่น ๆ และศึกษาปัจจัยสังคมกำหนดสุขภาพอื่นที่ยังไม่ได้ศึกษาในการวิจัยครั้งนี้

คำสำคัญ: ความตระหนักรู้เรื่องโรค โรคไตเรื้อรัง ปัจจัยสังคมกำหนดสุขภาพ

Background and Significance

CKD is a global public health issue and refers to prolonged kidney dysfunction in which kidney functions cannot be covered. The prevalence of CKD in persons 30 years and older has risen over the past decade.[1] CKD was the world's 12th leading cause of death, accounting for 1.2 million deaths.[2] In Indonesia, the number of new CKD patients has increased each year from 66,433 in 2018 and reached 1,501,016 in 2023.[3] As the fourth-largest province in Indonesia, Banten has the highest CKD prevalence in the country. In addition, the incidence of hypertension and diabetes mellitus in Banten is high. The number of CKD patients is expected to rise due to the increasing prevalence of these conditions.[4]

According to the Kidney Disease: Improving Global Outcomes (KDIGO) 2024 guidelines, CKD is defined as abnormalities of kidney structure or function that are present for at least three months.[5] A diagnosis of CKD requires either evidence of kidney damage such as abnormalities detected through imaging, urinalysis, or kidney biopsy or a sustained reduction in estimated glomerular filtration rate (eGFR). Importantly, individuals with a normal eGFR (i.e., CKD stage 1) who do not show any evidence of kidney damage are not classified as having CKD.[5] Therefore, this study focused on individuals in CKD stage 2 and 3, who exhibit decreased kidney function as indicated by reduced eGFR levels. This population represents a critical group for early intervention efforts aimed at slowing disease progression and preserving kidney function to prevent progression to latest stage of CKD or kidney failure. To achieve this, CKD awareness is essential.

Awareness of CKD refers to a recognition of a person about their CKD.[6-7] The goal is to reduce the burden of CKD by promoting lifestyle changes while ensuring that affected individuals receive timely treatment and disease control. Empowering individuals with knowledge and awareness about CKD can help control the progression of the disease, prevent complications, improve patient outcomes, reduce healthcare costs, and promote better long-term kidney health on a global scale.

Many patients with CKD, particularly in the early and moderate stages, are unaware of their condition due to its asymptomatic nature. Studies show that awareness increases with disease progression: only 16% of early-stage patients in the U.S. were aware of their CKD, compared to 40.1% in stage 4.[8] A more recent study involving 48 African American patients with moderate to severe CKD found that only 16 participants were aware of their diagnosis.[9] These findings highlight the urgent need to raise CKD awareness to support timely detection and management.

Awareness of CKD relates to many factors including social determinants of health (SDoH). SDoH have become a key factor in evaluating outcomes for CKD patients.[10] According to Healthy People 2030, SDoH encompasses five key domains including 1) the economic stability domain, 2) the education access and quality domain, 3) the health care access and quality domain, 4) the neighborhood and built environment domain, and 5) the social and community context domain. Each domain has different key issues.[10] All of the five domains are useful for addressing the factors associated with CKD awareness.

First, income is a key factor identified within the economic stability domain. Based on findings from the literature, people with low income were more likely to have low awareness of CKD.[11-12] However, some studies reported that income was not associated with CKD awareness.[7,13] Second, the education access and quality domain recognizes education as a foundational element in promoting health and well-being. In the CKD awareness context, patients with higher education showed higher CKD awareness.[11,13-14] However, some studies found that level of education had no association with CKD awareness.[8,13,15] Next, the health care access and quality domain refers to the ability of individuals to obtain timely, appropriate, and high-quality health care services. Evidence suggested that health literacy,

health insurance status, and frequency of health care visits were crucial factors associated with CKD awareness.[7,9,11] However, some findings are inconsistent.[11-13] Likewise, the neighborhood and built environment domain refers to where persons live and their impact to health. Several previous studies have found that individuals who face greater transportation barriers are more likely to experience health problems.[16-17] Transportation barriers can limit access not only to healthcare services such as check-ups and lab tests but also to health information from clinics. This reduced access may delay diagnosis and lower awareness of CKD. In this domain, transportation barriers have been found to be associated with CKD awareness. Last, in a social and community context domain, the absence of disease awareness may reflect a gap between patients and their healthcare providers. In this study, patient provider communication refers to specific interpersonal and communication behaviors such as how clearly the provider explains health information, listens to patient concerns, and encourages questions. These aspects are essential for enhancing patient understanding of their health status and may influence awareness of CKD, particularly in its asymptomatic early stages. Thus, effectiveness of patient and provider communication should be considered aside from patient factors on CKD awareness.[18] Nevertheless

only one study found no association between these two factors in CKD patients.[9]

In summary, CKD awareness is essential for preventing disease progression. To the best of our knowledge, no study has explored CKD awareness among Indonesian patients with early to moderate stages of CKD. Additionally, the associations between SDoH and CKD awareness remain inconclusive, and previous studies have not been conducted in the Indonesian context, where SDoH may differ due to distinct social, environmental, and cultural background. To address these knowledge gaps, further research is needed to assess CKD awareness levels and examine the associations between SDoH and CKD awareness among Indonesians with CKD. These findings may provide scientific evidence to guide interventions aimed at promoting CKD awareness in this population.

Objectives

1. To assess CKD awareness among patients with CKD stages 2 and 3 in Banten Province, Indonesia.

2. To examine the association between SDoH (including income, education, health literacy, health insurance status, frequency of health care visits, transportation barriers, patient-provider communication) and CKD awareness among patients with CKD stages 2 and 3 in Banten province, Indonesia.

Research Hypothesis

The SDoH including income, education, health literacy, health insurance status, frequency of health care visits, transportation barriers, and patient-provider communication are associated with CKD awareness among patients with CKD stages 2 and 3 in Banten province, Indonesia.

Methodology

This study was a predictive correlational study.

Population and sample

The convenience sampling method was conducted to recruit the sample in this study according to the inclusion and exclusion criteria. Patients with CKD who had eGFR 30-89 mL/min/1.73 m^2 (corresponding to stages 2 and 3 of CKD), well oriented in time, place, and persons, and were able to communicate with Indonesia language were recruited. Additionally, patients who had been diagnosed with psychiatric illnesses such as schizophrenia, anxiety, depression, delirium, or dementia or who were in a terminal condition and receiving palliative care were excluded.

The sample size was determined by the program G*Power 3.1.9.4.19 The minimum sample size was based on a predictive power from a prior study from Wanjala[11] that showed the impact of income on CKD awareness with odds ratio (OR) = 5.5. Based on this study, the sample size was calculated by using logistic regression with two tails,

Pr (Y = 1 │ X = 1) H_1 0.75 (proportion of patients who had high income and awareness of CKD), Pr (Y = 1 │ X = 1) H_0 0.36 (proportion of patients who had low income and awareness of CKD), α: 0.05 and power: 0.9, R^2 other X: 0, X distribution is binomial and X parm: 0.15 (proportion of patients who high income in the studied population). According to those criteria, the required sample size was 137.

Research instruments

The questionnaires consist of a personal information form and two validated instruments including Indonesia's health literacy short-form survey questionnaire (HLS-EU-SQ10-IDN) and Communication Assessment Tool (CAT).

Personal information form developed by the researchers contains questions on personal characteristics and clinical characteristics. Personal characteristics including education, income, health insurance, frequency of visits to health care, transportation barriers, and CKD awareness were responded by the participants. The clinical characteristics were completed by the principal investigator (PI) from patients' medical record. CKD awareness measuring by using one single-item self-report of kidney disease "Have you ever been told by a doctor or other health professional that you have weak or failing kidneys, kidney disease, or kidney problem? (do not include kidney stones, bladder infections or incontinence)?"[20]

The HLS-EU-SQ10-IDN was employed to measure health literacy. This questionnaire was developed by Asian Health Literacy Association (AHLA) Indonesia.[21] The scale consists of 10 items. The response ranges from very difficult (1) to very easy (4). The scale interpretations for health literacy levels were standardized to a consistent metric ranging from 0 to 50 using the formula: Index = (mean − 1) × (50/3). An index value could be interpreted into 4 levels of health literacy outcomes as follows: Inadequate (0-25); Problematic (26-33); Sufficient (34-42); and Excellent (43-50).[21]

Patient-provider communication was assessed by the CAT developed by Makoul, Krupat and Chang.[22] The CAT is a 15-item survey that assesses patients' opinions on a physician's communication effectiveness. The first 14 questions focus on the physician's interpersonal and communication abilities, while the final item addresses patient-staff interactions. The CAT is scored as follows: Poor = 1, Fair = 2, Good = 3, Very Good = 4, and Excellent = 5. The total score was calculated by summing all 15 items. The possible score range was 15 to 75, and the score was categorized into three levels: Fair (15-30), Good (31-60), and Very Good (61-75).[22]

The HLS-EU-SQ10-IDN and the CAT have been validated and widely used in various countries and settings; therefore, additional validation was not conducted in this study. To assess reliability, both instruments were tested with 30 patients who

had similar characteristics to the study sample. The Cronbach's alpha coefficients were 0.83 for the HLS-EU-SQ10-IDN and 0.89 for the CAT. Furthermore, reliability testing was also conducted using data from the full sample of 137 participants. The Cronbach's alpha values increased to 0.91 for the HLS-EU-SQ10-IDN and 0.95 for the CAT, indicating high internal consistency.

Ethical consideration

The study protocol was approved by the Institutional Review Board (IRB) of the Faculty of Nursing, Mahidol University, Thailand (COA No. IRB-NS2020/54.0412) and the Research Ethics Committee of the general hospital in Banten. The potential participants were informed regarding the study information i.e. the purposes of the study, the data collection process, and the participants' human rights. Informed consent was obtained before collecting the data.

Data collection

The data were collected from the patients who visited Internal Medicine Outpatient Department (OPD) of a general hospital in Banten, Indonesia. The staff nurses at the OPD clinic identified potential participants who met the study criteria and asked them about their willingness to meet the PI for the study. Once they gave permission, the PI introduced herself to provide information regarding the study protocol, objectives, risks, benefits, and privacy confidentiality to each potential participant. Then, the PI requested informed consent. The potential participants who gave informed consent were enrolled in the study. There were a total of 47 items that had been responded to by participants and took approximately 20-25 minutes to complete the questionnaires. The participants answered the questionnaires in a waiting room during waiting to visit the physicians. The PI asked permission from the participants to collect clinical data from their medical records after the participants finished answering the questionnaires.

Data analysis

The data were analyzed by using the SPSS version 18 licensed by Mahidol University. Frequencies and percentages were computed for categorical variables. Frequencies, percentages, means, standard deviation, and range were calculated for continuous variables. The Chi-square test was carried out to compare variables between awareness and unawareness of CKD. Binary logistic regression with passed assumptions was applied to examine associations between SDoH and the CKD awareness. Statistical significance was set at a p-value of < .05 for all analyses.

Findings

Personal characteristics

As shown in Table 1, more than half of the participants (56.9%) were aged 40-60 years old, with a mean age of 54.49 (SD = 11.23) years.

The number of males and females were similar (48.9% and 51.1%), respectively. Approximately 40% completed less than high school. Most of participants (73.8%) were married and employed (89.8%). The average of family monthly income was 4,436,496 Rupiah/month (SD = Rp. 3,288,524), (SD = Rp. 3,288,524), or 269.86 USD/month (The current exchange rate was 16,440 IDR per one US Dollar). More than one-third of the participants (49.6%) had incomes between 3,000,000 to 6,000,000 Rupiah/month (182.43 USD to 364.85 USD)/month. Regarding to transportation issues, 72.3% reported not find difficulties in transportation to the hospital. More than two-thirds (71.5%) of participants had clinic/hospital visits less than 6 times during past 12 months. Most participants used their health insurance as their medical payment method (73.0%). More than half of participants (61.3%) had insufficient health literacy. The overall patient-provider communication score was at a good level, with a mean score of 53.63 (SD = 9.87, Range 31-74). None of the participants had fair communication with healthcare providers.

Table 1: Personal characteristics of the study participants (N = 137)

Characteristics	n	%
Age (years)		
< 40	14	10.2
40-60	78	56.9
> 60	45	32.9
($\overline{X}$ = 54.49, SD = 11.23, Range 21-75 years)		
Gender		
Male	67	48.9
Female	70	51.1
Education		
Lower than high school	55	40.1
High school	43	31.4
University/higher	39	28.5
Marital status		
Single	5	3.6
Married	101	73.8
Separated/divorced	4	2.9
Widowed	27	19.7

Table 1: (cont.)

Characteristics	n	%
Employment		
Employed	123	89.8
Housework	36	26.3
Government officer	27	19.7
Private officer	18	13.1
Retired	16	11.7
Business	8	5.9
Others	18	13.1
Unemployed	14	10.2
Income (Rupiah/month)[1]		
< 3,000,000	40	29.2
3,000,000-6,000,000	68	49.6
> 6,000,000	29	21.2
($\overline{X}$ = Rp. 4,436,496, SD = 3,288,524 Range Rp. 500,000-Rp. 16,000,000)		
Transportation barriers		
No	99	72.3
Yes	38	27.7
Frequency of health care visits (past 12 months)		
< 6 times	98	71.5
≥ 6 times	39	28.5
($\overline{X}$ = 4.22, SD = 2.80, Range 1-12)		
Health insurance status		
No	37	27.0
Yes	100	73.0
Health literacy		
Insufficient	84	61.3
Sufficient	53	38.7
Patient-provider communication		
Good	95	69.3
Very good	42	30.7
($\overline{X}$ = 53.63, SD = 9.87, Range 31-74)		

[1] The current exchange rate was 16,440 IDR per one US Dollar

Clinical characteristics

As displayed in Table 2, the results showed that the participants in this study were in CKD stage 2 (40.9%) and stage 3 (59.1%). Almost all had comorbidity which were diabetes mellitus (61.8%) and hypertension (58.8%). The blood pressure was taking before participants met the physicians by a nurse in the OPD. Based on the blood pressure target recommended by the American College of Cardiology/ American Heart Association (ACC/AHA), more than half of the participants (55.5%) had uncontrolled blood pressure (≥130/80 mmHg).[5]

Table 2: Clinical Characteristics of the Study Participants (N = 137)

Characteristics	n	%
CKD stage		
Stage 2 (60-89 ml/min/1.73 m^2)	56	40.9
Stage 3A (45-59 ml/min/1.73 m^2)	36	26.3
Stage 3B (30-44 ml/min/1.73 m^2)	45	32.8
(Mean eGFR = 55.66, SD = 16.93, Range 30.27-88.94)		
Duration of CKD (years)		
< 1	41	29.9
1-2	87	63.5
> 2	9	6.6
Blood pressure level (Based on ACC and AHA)		
Controlled BP (< 130/80 mmHg)	61	44.5
Uncontrolled BP (≥ 130/80 mmHg)	76	55.5
Comorbidity		
Yes	136	99.3
No	1	0.7
Number of comorbidities [1,2]		
≤ 2 comorbid disease	94	69.1
≥ 3 comorbid disease	42	30.9
Type of comorbidities [1]		
DM	84	61.8
Hypertension	80	58.8
CVD	49	36.0
Hyperlipidemia	28	20.6
Others (Cirrhosis, Hepatitis, Hyperthyroidism, Gout, TB, GERD, HIV/AIDS, SLE, Pneumonia)	33	24.3

[1] N = 136, [2] multiple response allowed, ACC = American College of Cardiology, AHA = American Heart Association

Association between the study variables and awareness of CKD

As presented in Table 3, all variables including income, education, health literacy, health insurance, frequency of visit to health care, transportation barriers, and patient-provider communication were significantly associated with awareness of CKD.

Table 3: Association between the study variables and awareness of CKD

Independent variables	All (N = 137) n (%)	Awareness, (N = 44) n (%)	No awareness, (N = 93) n (%)	χ^2	p-value
Income (Rupiah/month)				12.48	.002
< 3,000,000	40 (29.2)	5 (11.3)	35 (37.6)		
3,000,000-6,000,000	68 (49.6)	24 (54.5)	44 (47.3)		
> 6,000,000	29 (21.2)	15 (34.2)	14 (15.1)		
Education				34.79	< .001
Lower than high school	55 (40.1)	5 (11.3)	50 (53.8)		
High school	43 (31.4)	13 (29.5)	30 (32.3)		
University/higher	39 (28.5)	26 (59.2)	13 (14.9)		
Health literacy				27.57	< .001
Insufficient	84 (61.3)	13 (29.6)	71 (76.3)		
Sufficient	53 (38.7)	31 (70.4)	22 (23.7)		
Health insurance				5.87	.015
No	37 (27.0)	6 (13.6)	31 (33.3)		
Yes	100 (73.0)	38 (86.4)	62 (66.7)		
Frequency of visit to health care (past 12 months)				9.18	.002
< 6 times	98 (71.5)	24 (54.6)	74 (79.6)		
≥ 6 times	39 (28.5)	20 (45.4)	19 (20.4)		
Transportation barriers				6.43	.011
No	99 (72.3)	38 (86.4)	61 (65.6)		
Yes	38 (27.7)	6 (13.6)	32 (34.4)		
Patient-provider communication				4.78	.029
Good	95 (69.3)	25 (56.8)	70 (75.3)		
Very good	42 (30.7)	19 (43.2)	23 (24.7)		

Social determinants of health associated with awareness of CKD

In binary logistic regression, the results showed that having high school education (OR = 5.26, 95%CI [1.06, 25.90]), higher education (OR = 16.49, 95%CI [2.77, 97.96]), sufficient health literacy (OR = 4.97, 95%CI [1.42, 17.37]) and had visited health care more than 6 times during past 12 months (OR = 3.31, 95%CI [1.13, 9.67]) were more likely to have awareness of CKD, as shown in Table 4.

Table 4: Binary logistic regression analysis of CKD awareness

Variables	B	SE	Wald	OR	95%CI	p-value
Income (Rupiah/month)						
< Rp. 3,000,000	Ref.	-	0.74	-	-	.689
Rp. 3,000,000 - Rp. 6,000,000	-0.18	.78	0.05	0.83	0.18, 3.84	.816
> Rp. 6,000,000	-0.69	.97	0.51	0.50	0.07, 3.34	.475
Education						
Less than high school	Ref.	-	9.73	-	-	.008
High school	1.66	.81	4.17	5.26	1.06, 25.90	.041
Higher education	2.80	.91	9.51	16.49	2.77, 97.96	.002
Health literacy						
Insufficient	Ref.	-	-	-	-	-
Sufficient	1.60	.64	6.32	4.97	1.42, 17.37	.012
Health insurance						
No	Ref.	-	-	-	-	-
Yes	0.89	.61	2.19	2.45	0.74, 8.04	.139
Frequency of visit to health care (during 12 months)						
< 6 times	Ref.	-	-	-	-	-
≥ 6 times	1.12	.55	4.82	3.31	1.13, 9.67	.028
Transportation barriers						
Yes	Ref.	-	-	-	-	-
No	0.37	.61	0.38	1.45	0.44, 4.75	.538
Patient-provider communication						
Good	Ref.	-	-	-	-	-
Very good	-0.87	.62	1.97	0.42	0.12, 1.41	.161

Note: Hosmer-Lemeshow test; $\chi^2 = 8.40$, df = 8, p-value = .395, Cox & Snell $R^2 = .33$, Nagelkerke $R^2 = .47$, Predictive correct = 83.9%; OR = Odd ratio, CI = Confidence Interval

Discussion

Of 137 patients with CKD, approximately only one third (32.1%) of the participants were aware of their CKD. This result is consistent with previous studies. A recent systematic review and meta-analysis by Chu, et al.[23] reported that from 18 studies, the majority of them indicate that less than 50% of individuals with CKD are aware of their CKD condition, with an overall estimated awareness rate of 19.2%.

Moreover, the majority of participants in this study who aware of CKD were in stage 3B (61.3%). This result supported many previous studies that awareness of CKD associated with advanced stages or lower levels of eGFR.[9,13] One possible explanation is that patients with more advanced stages of CKD are more likely to experience noticeable clinical symptoms (e.g., fatigue, edema), prompting them to seek medical attention. In such cases, healthcare providers may be more inclined

to discuss the diagnosis explicitly, thereby increasing the patient's disease awareness. Furthermore, stage 3B often corresponds with a more significant decline in eGFR, which may result in more frequent laboratory testing and follow-up visits, thus increasing the opportunities for patients to become informed about their CKD status. Therefore, the observed association between CKD awareness and stage 3B may reflect both the clinical manifestations of the disease and the structure of healthcare delivery in managing more advanced stages of CKD.

This study followed SDoH by Healthy People 2030.[10] The independent variables were derived from all five domains of the SDoH. The results of the logistic regression analysis showed that education (from the education access and quality domain) and health literacy and frequency of visit to health care (from health care access and quality domain) significantly associated with CKD awareness among patients with CKD.

Education was the most significant determinant of CKD awareness in this study. In line with this finding, education is an important factor predicting the awareness of CKD in previous studies.[11, 14-15] Patients with more education have a better understanding to accept the information about the disease. Their education helps them to understand their health and CKD.[24] In Kenya, the education

status of the respondents had a significant relationship with the awareness of CKD.[11] Similarly, people with less education were less likely to be aware of their CKD in Bali, Indonesia.[14] On the large scale, data in the U.S. found that education was statistically significant with awareness of CKD.[8] Thus, the pieces of evidence suggest that higher educational attainment is associated with greater CKD awareness.

Health literacy also had a strong determinant of CKD awareness. Health literacy was a foundation to understand the status of CKD. Not only understand, but people with sufficient health literacy are able to use the information necessary to obtain adequate health care.[11,24] Thus, based on the literature it is not surprising that health literacy had significant association with the awareness of CKD in this study. Nevertheless, the participants in this study received information about their health from an internal medicine doctor. Thus, it may be possible for them to get more health information about their comorbidities i.e. diabetes and hypertension than about CKD.

Related to the frequency of health care visits, the present study found that it had significant association with awareness of CKD. The possible explanation for this finding is that the majority of the participants had diabetes or hypertension, they were more likely to obtain their health check-up,

visit their physician, and receive treatment. In the study setting, physicians typically schedule follow-up appointments every one to two months. These routine healthcare visits provide more opportunities for patient–provider communication and symptom-driven consultations, thereby enhancing disease awareness. In contrast, Murphy, et al.[9] found that among African-American patients with CKD and hypertension, discussions about CKD during routine clinic visits in primary care were not significantly associated with increased CKD awareness. This discrepancy may reflect differences in the quality, clarity, or emphasis of communication about CKD, as well as contextual differences in healthcare systems and patient engagement. These findings underscore the importance not only of regular healthcare visits, but also of effective, patient-centered communication in raising CKD awareness.

Unlike the others, health insurance status is the only variable from the health care access and quality domain that was not significantly associated with awareness of CKD. It is possible that simply having insurance does not guarantee an increase in accessibility to high-quality care or improved health education. Nonetheless, the current study was conducted in a government hospital, where the majority of patients are covered by Indonesia's government-subsidized national health insurance.

In the economic stability domain, this study found that income was statistically associated with awareness of CKD. However, income was not a significant determinant of CKD awareness. Surprisingly, individuals with low income also had a good CKD awareness. This may be due to people with low income have more concern with their health. They are worried about high cost of treatments.[13] This result was distinguishable with one study from United States found that individuals who were CKD aware had lower income.[13] In addition, it is possible that people with high income did not ensure that they would get more health education, counseling, and advice from the doctors. Treatment was provided equally to all participants, as most of them were covered by the government-subsidized national health insurance.

In the neighborhood and built environment domain, the present study found that transportation barrier was not a powerful determinant. Yet, the finding revealed that having transportation barriers did not vary in awareness of CKD. Although literature review found that transportation barriers could lead to postponed or missed visits, delayed treatment, and missing or delayed prescription use.[16-17] However, most of the participants in this study had their own vehicles and had families who could give them a ride to the hospital. Moreover, for participants who lived far from the hospital,

it is not difficult for them to reach the hospital. Even so, the current study was conducted in the hospital located in the capital city. Public transportation is also not difficult to find. Thus, these could be the reason that transportation barriers were not significant determinant awareness of CKD.

Regarding social and community context domain, patient-provider communication was not a significant determinant of CKD awareness. To the best of our knowledge, this is the first time that patient-provider communication was used as a determinant of CKD awareness in Indonesia. Some studies found that poor communication can result in a lack of CKD awareness because of failing to educate individuals with CKD about their kidney disease.[9,25] However, the current study found that even the participants had good communication with their health care provider, they were still not aware of their CKD. The present study was conducted in the Internal Medicine OPD. There were only 2 medical physicians and 2 nurses on duty with around 40-50 patients per day. It may be difficult for them to conduct proper communication and provide effective health education due to a lack of time and a high patient load.

There were several limitations in this study. Firstly, this study was a cross-sectional study, and data were collected by convenience sampling. As a result, cause and effect relationships could not be examined. Secondly, the study was conducted in one setting. The generalizability is limited. Thus, the study could apply to Indonesia populations who have similar characteristics with the participants in this study. Further studies should conduct longitudinal studies and replicate the study in larger samples to enhance the statistical power of tests and in other settings to increase generalizability of the findings.

Conclusion and Recommendations

The present study showed that only 32.1% of the participants had awareness of CKD. The majority of participants who aware of CKD were in stage 3B (61.3%), which is a later stage of CKD and indicates a significant decline in kidney function. Based on the results, education, health literacy and frequency of visit to health care were significant determinants of awareness of CKD among patients with CKD. It is recommended that nurses and health care professionals should pay more attention to patients who have low education, low health literacy, and healthcare visits less than 6 times during the past 12 months. Effective health-literacy-based interventions—such as brief educational counseling and culturally appropriate group education sessions tailored to patients with low literacy—should be implemented to ensure that patients are aware of their CKD status, understand relevant health information, and are able to manage the disease appropriately to slow CKD progression.

References

1. Centers for Disease Control and Prevention (CDC). Kidney disease surveillance system [Internet]. Atlanta, GA: CDC; 2024 [cited 2025 Mar 1]. Available from: https://nccd.cdc.gov/CKD/Default.aspx.

2. Carney EF. The impact of chronic kidney disease on global health. Nat Rev Nephrol. 2020;16(5):251. doi: 10.1038/s41581-020-0268-7.

3. Ministry of Health Republic, Indonesia. Indonesia health profile 2023 [Internet]. Jakarta: Ministry of Health Republic, Indonesia; 2024 [cited 2025 Mar 1]. Available from: https://www.kemkes.go.id/eng/profil-kesehatan-indonesia-2023.

4. Banten Provincial Health Office. Hypertension in Banten [internet]. Banten: Banten Provincial Health Office; 2022 [cited 2025 Mar 1]. Available at: https://dinkes.bantenprov.go.id/ (in Indonesia).

5. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int. 2024;105 Suppl 4:S117-S314. doi: 10.1016/j.kint.2023.10.018.

6. Younes S, Mourad N, Safwan J, Dabbous M, Rahal M, Al Nabulsi M, et al. Chronic kidney disease awareness among the general population: tool validation and knowledge assessment in a developing country. BMC Nephrol. 2022;23(1):266. doi: 10.1186/s12882-022-02889-2.

7. Chu CD, McCulloch CE, Banerjee T, Pavkov ME, Burrows NR, Gillespie BW, et al. CKD awareness among US adults by future risk of kidney failure. Am J Kidney Dis. 2020;76(2):174-83. doi: 10.1053/j.ajkd.2020.01.007.

8. Tuot DS, Wong KK, Velasquez A, Crews DC, Zonderman AB, Evans MK, et al. CKD awareness in the general population: performance of CKD-specific questions. Kidney Med. 2019;1(2):43-50. doi: 10.1016/j.xkme.2019.01.005.

9. Murphy KA, Greer RC, Roter DL, Crews DC, Ephraim PL, Carson KA, et al. Awareness and discussions about chronic kidney disease among African-Americans with chronic kidney disease and hypertension: a mixed methods study. J Gen Intern Med. 2019;35(1):298-306. doi: 10.1007/s11606-019-05540-3.

10. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. Social determinants of health [Internet]. Washington, DC: Office of Disease Prevention and Health Promotion; 2030 [cited 2025 Mar 1]. Available from: https://odphp.health.gov/healthypeople/priority-areas/social-determinants-health.

11. Wanjala W. Awareness of chronic kidney disease, its predictors and self-management behaviors among high risk patients in Kenyatta National Hospital [dissertation]. Nairobi, Kenya: University of Nairobi; 2019. 81 p.

12. Iroegbu C, Lewis L, Matura LA. An integrative review: chronic kidney disease awareness and the social determinants of health inequities. J Adv Nurs. 2022;78(4):918-28. doi: 10.1111/jan.15107.

13. Tummalapalli SL, Vittinghoff E, Crews DC, Cushman M, Gutiérrez OM, Judd SE, et al. Chronic kidney disease awareness and longitudinal health outcomes: results from the reasons for geographic and racial differences in stroke study. Am J Nephrol. 2020;51(6):463-72. doi: 10.1159/000507774.

14. Dharmapatni NWK, Putri NMME. Community knowledge and self-awareness on risk factors for Chronic Kidney Disease (CKD). Babali Nursing Research. 2023;4(4):705-13. doi: 10.37363/bnr.2023.44294.

15. Hödlmoser S, Winkelmayer WC, Zee J, Pecoits-Filho R, Pisoni RL, Port FK, et al. Sex differences in chronic kidney disease awareness among US adults, 1999 to 2018. PloS One. 2020; 15(12):e0243431. doi: 10.1371/journal.pone.0243431.

16. Henning-Smith C. The public health case for addressing transportation-related barriers to care. Am J Public Health. 2020;110(6):763-4. doi: 10.2105/AJPH.2020.305638.

17. Li PK-T, Garcia-Garcia G, Lui S-F, Andreoli S, Fung WW-S, Hradsky A, et al. Kidney health for everyone everywhere: from prevention to detection and equitable access to care. Can J Kidney Health Dis. 2020;7:1-11. doi: 10.1177/2054358120910569.

18. Jafar TH, Ramakrishnan C, John O, Tewari A, Cobb B, Legido-Quigley H, et al. Access to CKD care in rural communities of India: a qualitative study exploring the barriers and potential facilitators. BMC Nephrol. 2020;21(1). doi: 10.1186/s12882-020-1702-6.

19. Faul F, Erdfelder E, Buchner A, Lang A-G. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. Behav Res Methods. 2009;41(4):1149-60. doi: 10.3758/BRM.41.4.1149.

20. Chu CD, Chen MH, McCulloch CE, Powe NR, Estrella MM, Shlipak MG, et al. Patient awareness of CKD: a systematic review and meta-analysis of patient-oriented questions and study setting. Kidney Med. 2021 Jul 1;3(4):576-585.e1. doi: 10.1016/j.xkme.2021.03.014.

21. Rachmani E, Hsu CY, Nurjanah N, Chang PW, Shidik GF, Noersasongko E, et al. Developing an Indonesia's health literacy short-form survey questionnaire (HLS-EU-SQ10-IDN) using the feature selection and genetic algorithm. Comput Methods Programs Biomed. 2019:182:105047. doi: 10.1016/j.cmpb.2019.105047.

22. Makoul G, Krupat E, Chang C-H. Measuring patient views of physician communication skills: development and testing of the communication assessment tool. Patient Educ Couns. 2007;67 (3):333-42. doi: 10.1016/j.pec.2007.05.005.

23. Chu L, Bhogal SK, Lin P, Steele A, Fuller M, Ciaccia A, et al. Awareness of diagnosis and treatment of chronic kidney disease in adults with type 2 diabetes (AWARE-CKD in T2D). Can J Diabetes. 2022 Feb. doi: 10.1016/j.jcjd.2022.01.008.

24. Wei C-J, Shih C-L, Hsu Y-J, Chen Y-C, Yeh J-Z, Shih J-H, et al. Development and application of a chronic kidney disease-specific health literacy, knowledge and disease awareness assessment tool for patients with chronic kidney disease in Taiwan. BMJ Open. 2021;11(10):e052597. doi: 10.1136/bmjopen-2021-052597.

25. Stolpe S, Kowall B, Scholz C, Stang A, Blume C. High unawareness of chronic kidney disease in Germany. Int J Environ Res Public Health. 2021; 18(22):11752. doi: 10.3390/ijerph182211752.