

## Awareness of Chronic Kidney Disease among General Adult Population in Indonesia

Susi Ari Kristina<sup>1\*</sup>, Laksmi Anggun Larasati<sup>2</sup>, Suci Hanifah<sup>3</sup>

1. *Department of Pharmaceutics, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia.*

2. *Clinical Pharmacy Graduate Program, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia.*

3. *Department of Pharmacy, Faculty of Mathematics and Sciences, Universitas Islam Indonesia.*

**\*Corresponding Author: Susi Ari Kristina**

### Abstract

Background: Chronic kidney disease (CKD) is rapidly becoming a major problem for developing countries such as Indonesia in terms of complicated management such as hemodialysis, continuous ambulatory peritoneal dialysis (CAPD) or high-cost renal transplantation. In its initial stages, early diagnosis and management of CKD may help avoid or delay disease progression. This study aimed to assess CKD's awareness and knowledge in Indonesia's general population. Methods: Cross-sectional research design was performed among the general adult population in Yogyakarta province. Recruiting participants using a convenience sample. A pre-validated questionnaire consisted of two parts, demographic features and CKD information. A logistic bivariate regression was used to identify independent CKD predictors and p-value <0.05 was considered significant. Results: Most of the 630 study participants were female, high school graduate, middle economic class, 5 kilometers away from a health center, no family history of CKD or hypertension, non-smoker, and not obese. Most participants had the lowest correct response on CKD signs, risk factors, domain testing and diagnosis. Association of features and understanding of kidney disease observed in female gender, higher education, further distance from health services, those with family history of kidney disease, hypertension, non-smoker, and obese participants. Conclusion: Adult information and understanding of chronic kidney disease relatively small in Indonesia. This research provides health educators or doctors with information to increase awareness and understanding.

**Keywords:** *Chronic kidney disease, Awareness, Knowledge, General population.*

### Introduction

Chronic kidney disease (CKD) is described as a progressive loss of kidney function characterized by a gradual replacement of normal fibrotic tissue kidney structure [1]. Reduced kidney function indicated by glomerular filtration rate (GFR) less than 60 mL / min per 1.73 m<sup>2</sup> or kidney damage marker, or both for at least 3 months [2]. CKD prevalence in the general population is 13.4 percent globally [1]. According to the 2015 global disease burden study, CKD was the 17th leading cause of global year life loss and one of the fastest rising major causes of death as overall CKD mortality increased by 31.7% from 2005 to 2015. CKD rapidly becomes a major health, social and economic problem for developing countries like Indonesia [4]. CKD stage V or end-stage

renal disease (ESRD) requires complicated treatment including renal replacement therapy such as hemodialysis, continuous outpatient peritoneal dialysis (CAPD) or renal transplantation that is very expensive and limited in some centers [5]. Indonesia's CKD etiologies and prevalence are glomerulonephritis (39.87%), diabetic nephropathy (17.54%), hypertension (15.72%), obstructive and infective (13.44%), unknown (10.93%) and polycystic kidney disease (2.51%) [5]. During its initial stages, early diagnosis and management of CKD can help prevent or delay disease progression [6]. Yet, most CKD cases aren't identified early [7]. CKD awareness among patients includes general knowledge of CKD, its risk factors, and individual risk and CKD status

consequence and understanding [8]. CKD knowledge can be ascertained by providing a correct definition of CKD or correctly naming risk factors, symptoms and CKD diagnostic tests [8]. A regional cross-sectional survey conducted in six regions (Central Asia, Southern Asia, Middle East, Africa, Western Europe, and Latin America) found only 6% of the population aware of CKD [7].

A study by Chow *et al* found poor general public knowledge in CKD and suggested future studies in a high-risk individual's population [7]. Training to enhance awareness plays a significant role in CKD prevention regardless of whether primary, secondary or tertiary prevention requires modifying lifestyle patterns is a prerequisite for behavioral change [9].

Determining CKD's public knowledge can also guide health professionals, researchers, and kidney health organizations in identifying the need for education campaigns [2]. There are many CKD awareness studies around the world [1, 2, 9-11]. Most study used a questionnaire to assess the patient's awareness and knowledge of CKD. The result showed a general population understanding of CKD was relatively low [2, 10].

The study participant had limited knowledge of the kidney 's physiological role, especially in regulating blood pressure, bone development, and metabolism, knowledge of CKD's risk factor was also limited [2]. CKD's awareness and knowledge data in Indonesia were limited. This study aimed to evaluate the awareness and knowledge of CKD in the general population in Indonesia, particularly the resident area of Yogyakarta, using the established questionnaire that has already been modified after reviewing various literatures. The questionnaire contains five main areas of knowledge, symptoms, treatment, risk factors, and testing and diagnosis of CKD.

## Methods

The study was performed in community setting in Province Yogyakarta, located in the southern part of Java Island. Adults (age 40 and more) were invited to daily community meetings and those who signed written consent were recruited to the study. The study excluded confirmed chronic kidney disease and critically ill patients. The convenience sampling method used to

estimate CKD disease awareness. A pre-validated questionnaire was developed from review a variety of literatures [9-11]. The questionnaire consisted three parts: the first part is sociodemographic and condition characteristic, and the second section has 5 domains evaluating CKD information, composed of 17 items yes-no questions. Four specialists in kidney and clinical pathology have checked the instrument for instrument validity.

Prior to the survey, the questionnaire was administered to 30 non-sample populations. Gadjah Mada University's institutional review board (IRB) accepted the study procedure and we received ethical clearance. Participants were clarified the intent and procedure of this research, and each respondent requested verbal informed consent. Personal information protection was secured and confidential.

Data were checked for completeness and analyzed to SPSS version 22. Descriptive statistics used to present participants' sociodemography and clinical characteristics. Bivariate logistic regression was used to test the relationship between independent variables, and information of CKD and p-value variables was considered statistically significant.

## Results

This study conducted in 630 general Yogyakarta resident adult participants. Table 1 shows subject characteristics at 45-50 (35.40%) age group, male gender (54.76%), graduated high school (40.63%), middle economic status (55.87%), distance from health facilities more than 5 kilometers (39.37%), lacked a family history of CKD (88.57%), had no history of hypertension (75.56%). Table 2 indicates the participants' outcome of the CKD questionnaire. The questionnaire covered five areas, general information, symptoms, treatment, risk factors, and CKD testing and diagnosis.

Most participants (> 80%) knew the general knowledge of CKD, they correctly replied that CKD is a kidney disease that cannot absorb waste, contaminants, and body fluids, and that CKD also has five stages and progression that can lead to kidney failure. Unfortunately, most participants responded incorrectly when asked about CKD symptoms.

They didn't know the CKD signs were tiredness, low appetite, trouble sleeping, and itchy skin. More than 50 % of participants responded correctly to CKD treatment, especially kidney transplants and dialysis. They knew dialysis treatment was about filtering the blood, removing toxins, waste, and excess fluid. But the correct answer reduces the impact of either compliance with treatment schedule or following treatment plan as prescribed to the patient's health.

The lowest correctly answered domain was risk factors, nearly 70 percent responded incorrectly to the question. They did not know that high blood pressure, diabetes, obesity, history, or recent kidney disease family member is a significant risk factor to avoid or reduce chronic kidney disease. The last domain questioned was about CKD testing and diagnosis, which was also poorly

answered by participants. They didn't know much about checking and diagnosing to decide whether they had CKD. Table 3 summarizes the association between subject characteristics and CKD awareness among the general adult population in Yogyakarta.

We measured and analyzed used odds ratio numbers with 95 % confidence interval found that gender, age, economic status, distance from health facilities, CKD family history, hypertension, smoking status, a body mass index (BMI) significantly associated with CKD awareness. According to our results, adults with a family history of chronic kidney disease (OR; 3.46 95 % CI 1.78-5.23) and those with hypertension (OR; 3.25 95 % CI 1.54-4.96) were three times more conscious of CKD than those without CKD family history and hypertension.

**Table 1: Subject characteristics (N = 630)**

Characteristic	N	%
<b>Age Group</b>		
40-45	217	34.44
45-50	223	35.40
51-55	97	15.40
56-60	93	14.76
<b>Gender</b>		
Male	345	54.76
Female	285	45.24
<b>Education</b>		
Elementary school	230	36.51
Junior high school	256	40.63
Senior high school	144	22.86
<b>Economic status</b>		
Low	278	44.13
Middle	352	55.87
<b>Distance from health facilities</b>		
<2 km	145	23.02
2-5 km	237	37.62
>5 km	248	39.37
<b>Family history of CKD</b>		
Yes	72	11.43
No	558	88.57
<b>Having hypertension</b>		
Yes	154	24.44
No	476	75.56
<b>Smoking status</b>		
Smoker	132	20.95
Non-smoker	498	79.05
<b>Body Mass Index (BMI)</b>		
Underweight-normal	342	54.29
Overweight	156	24.76
Obese	132	20.95

**Table 2: Domain of knowledge of chronic kidney disease awareness and respondent's responses (N=630)**

Domain of knowledge	Question item	Correct answer (N)	%
CKD General knowledge	Heard of kidney failure	543	86.19
	CKD is kidney condition that unable to filter waste, toxins, and fluids from body	540	85.71
	CKD has five stages and progression can lead to kidney failure	523	83.02
CKD Symptoms	Tiredness	248	39.37
	Poor appetite	242	38.41
	Difficulty sleeping	231	36.67
	Itchy skin	212	33.65
CKD Treatment	Treatments for kidney failure include kidney transplant and dialysis	490	77.78
	Dialysis is a treatment for kidney failure that filters blood to	429	68.10

	remove toxins. Waste. and excess fluid		
	Dialysis requires compliance to treatment schedule	342	54.29
	When following treatment plan as prescribed. people can live healthy	321	50.95
Risk factors	High blood pressure	189	30.00
	Diabetes	187	29.68
	Obesity	120	19.05
	Family members with kidney disease	109	17.30
Testing and diagnosis	Kidney disease is diagnosed with a simple blood test	231	36.67
	Glomerular filtration rate (GFR). is a measure of kidneys are functioning	204	32.38

Table 3: Association between subject characteristics and awareness of CKD

Characteristics	Awareness of CKD	
	OR	CI
<b>Age (years)</b>		
<50	1	0.56-2.21
51 and more	1.14	
<b>Gender</b>		
Male	1	1.12-3.67
Female	2.19	
<b>Education</b>		
Elementary school	1	
Junior high school	2.13	1.23-3.42
Senior high school	2.57	1.42-4.13
<b>Economic status</b>		
Low	1	
Middle	2.32	1.45-4.64
<b>Distance from health facilities</b>		
<5 km	1	
5 km and more	2.52	1.56-4.84
<b>Family history of CKD</b>		
No	1	
Yes	3.46	1.78-5.23
<b>Having hypertension</b>		
No	1	
Yes	3.25	1.54-4.96
<b>Smoking status</b>		
Smoker	1	
Non-smoker	2.67	1.35-4.63
<b>BMI</b>		
Underweight-normal	1	
Overweight	2.53	1.32-4.31
Obese	2.56	1.35-5.32

## Discussion

The purpose of this study was to evaluate CKD awareness and knowledge among the general population in the Yogyakarta region using established questionnaire after reviewing various literature. The study conducted 630 participants and the result showed that three domains that mostly responded incorrectly were CKD symptoms, risk factors, and the domain of testing and diagnosis.

The general population had very limited knowledge of CKD risk factors among the three domains. They did not know that hypertension, diabetes mellitus, obesity and kidney disease history are important risk factors, similar to another finding of this study [2, 8]. Identifying factors predisposing an individual to CKD is essential in terms of personal and community health, as some risk factors can be altered and can prevent or slow progression to ESRD [11].

Another study found that older age, obesity, elevated systolic blood pressure (SBP), hypertension, increased waist circumference, type 2 diabetes mellitus, longer diabetes length, and kidney disease family history were significantly associated with CKD [12]. The results showed that females were 2.19 times more aware of CKD than males (95 percent CI 1.12-3.67). Research by Haugan et al on the role of gender inactive attitude towards treatment and health showed that women assessed their attitude as more active than men, understood and knew their health, experienced more positive emotions, and had a stronger motivation to engage in their health issues than men [13].

Research on internet use to scan for health and medicine information indicated women tend to look for online health information than men [14]. Maybe that's why women are

more mindful of their health and diseases. It is clear that participants who graduate from high school 2.57 (95 % CI 1.42-4.13) are more aware of kidney disease than those who only graduated from elementary school.

A study result showed that knowledge of health and disease was significantly higher in high school graduates compared to those with lower education [15]. High school graduates more frequently felt they had the ability to take control action and heard their suggestions, so the level of education could be related to the degree of empowerment [15]. This result suggests that higher education may increase health literacy. Health literacy, which is a means by which education is correlated with health outcomes[16] to receive, process and understand essential knowledge in order to make healthcare decisions.

Regarding economic status, the result was that groups with middle economic status were 2.32 (95 percent CI 1.45-4.64) times more CKD-conscious than low economic status. This result matches other studies [17, 18]. A CKD knowledge study in Malaysia found that a lower-income group (< RM 2000) had the lowest mean knowledge score on CKD compared to the higher-income group respondent [17].

This phenomenon indicated that those with higher incomes have more access to health knowledge, and focus on their own health behavior [19]. Participants over 5 kilometers away from the health facility were 2.52 times (95 percent CI 1.56-4.84) more aware of CKD. This surprising result the other research, person with closer distance from home to the nearest medical institution had the higher score of health knowledge due to most people getting health knowledge from physicians, meaning that the medical institutions were closer to home, the more convenient they went there, the higher contact frequency they had[18].

Residents with further distance to the nearest health facility may use other media to advance health information. Kristina et al revealed that mostly Yogyakarta pharmacy customers use the internet to search for medicine or health-related information [14]. The advantage of using a mobile phone is increasing access to health-related information, advice, and medical advice [20].

Regarding CKD's family history, this study found that participants with CKD family history 3.46 times more aware than those without family history (95 percent CI 1.78-5.23). Family members of CKD patients have a high incidence of CKD and its risk factors, it is recommended to screen at-risk CKD family members in an effort to avoid kidney disease [11].

Genetic and environmental factors are likely to lead to family aggregation of chronic kidney disease [21]. Genes leading to structural defects in the kidney (podocin, encoding with NPHS2 genes), non-muscle myosin heavy chain 9 (MYH9), and activation of sympathetic nervous system chromogranin A (CHGA) lead to what was known as ESRD [21]. Gheewala et al found that individuals with a family history of kidney disease correlated with higher knowledge score were expected as knowing a person with CKD would be able to raise awareness indirectly [2].

A person who is 3.25 times more conscious than yo who has no hypertension (95% CI 1.54-4.96). Hypertension is a risk factor for CKD, hypertension of any etiology can lead to kidney impairment, and increased blood pressure accompanied by proteinuria is an important factor in CKD progression [22]. A study showed that patients with hypertension had CKD recognition and average knowledge [1].

Based on the result, non-smoker and obese participants had a higher awareness of CKD than smoking and not obese participants. Overfat is an important risk factor for kidney disease. It may increase the risk of type 2 diabetes, hypertension, and atherosclerosis, indirectly leading to CKD [23]. Patients with high BMI experienced a faster decline in kidney function, especially among older patients and those with BMI range above 35 kg/m<sup>2</sup> [23]. A Yang et al study on health knowledge and risk perception among smokers and non-smokers found that smokers or current smokers had lower health awareness, lower health values, or lower health information exposure [24].

Another research found that current non-smokers were 1,6-1,7 times likely to have better knowledge from better access to meaningful smoking-health information[25].

Knowing the health risk of obesity or smoking could increase participant knowledge and awareness. Some limitations of this study may be addressed in future studies. Firstly, the study was based on a cross-sectional study design and should be interpreted in that sense. Second, this study could not include all the general adult populations in Yogyakarta, which may not be generalizable to all populations. Third, this study did not provide information about the device or tool for people to obtain health information.

## References

- Kumela Goro K, Desalegn Wolide A, Kerga Dibaba F, Gashe Fufa F, Wakjira Garedow A, Edilu Tufa B, et al (2019) Patient Awareness, Prevalence, and Risk Factors of Chronic Kidney Disease among Diabetes Mellitus and Hypertensive Patients at Jimma University Medical Center, Ethiopia. *BioMed Res Int.*, 1-8.
- Gheewala PA, Peterson GM, Zaidi STR, Jose MD, Castelino RL (2018) Public knowledge of chronic kidney disease evaluated using a validated questionnaire: a cross-sectional study. *BMC Public Health.*, (1):371.
- Wang H, Naghavi M, Allen C, Barber RM, Bhutta ZA, Carter A, et al (2016) Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet*, 1459-544.
- Prodjosudjadi W, Suhardjono, Suwitra K, Pranawa, Widiyana IGR, Loekman JS, et al (2009) Detection and prevention of chronic kidney disease in Indonesia: Initial community screening. *Nephrology*, 14(7):669-74.
- Fauziyati A (2017) Global challenge of early detection and management of chronic kidney disease. *J. Kedokt Kesehatan Indones.*, 8(1):1-2.
- Johnson DW, Atai E, Chan M, Phoon RK, Scott C, Toussaint ND, et al (2013) KHA-CARI Guideline: Early chronic kidney disease: Detection, prevention and management: Early chronic kidney disease guidelines. *Nephrology*, 18(5):340-50.
- Hussain S, Habib A, Najmi AK (2019) Limited Knowledge of Chronic Kidney Disease among Type 2 Diabetes Mellitus Patients in India. *Int. J. Environ. Res. Public Health*, 16(8):1443.
- Plantinga LC, Tuot DS, Powe NR (2010) Awareness of Chronic Kidney Disease Among Patients and Providers. *Adv Chronic Kidney Dis.*, 17(3):225-36.
- Chow WL, Joshi VD, Tin AS, van der Erf S, Lim JFY, Swah TS, et al (2012) Limited knowledge of chronic kidney disease among primary care patients -a cross-sectional survey. *BMC Nephrol.*, 13(1):54.
- Tuot DS, Wong KK, Velasquez A, Crews DC, Zonderman AB, Evans MK, et al (2019) CKD Awareness in the General Population: Performance of CKD-Specific Questions. *Kidney Med.*, 1(2):43-50.
- Kazancioğlu R (2013) Risk factors for chronic kidney disease: an update. *Kidney Int. Suppl.*, 3(4):368-71.
- Damtie S, Biadgo B, Baynes HW, Melak T, Asmelash D, Abebe M (2018) Chronic Kidney Disease and Associated Risk Factors Assessment among Diabetes Mellitus Patients at A Tertiary Hospital, Northwest Ethiopia. *Chronic Kidney Dis.*, 28(6):10.
- Chylińska J, Łazarewicz M, Rządiewicz M, Adamus M, Jaworski M, Haugan G, et al (2017) The role of gender in the active attitude toward treatment and health among older patients in primary health care self-assessed health status and sociodemographic factors as moderators. *BMC Geriatr.*, 1: 284.

## Conclusion

This study found most participants had less information about signs of chronic kidney disease, risk factors, monitoring, and diagnosis. Association of kidney disease characteristics and awareness was found on female gender, higher-level education, further distance from health facilities, those with a family history of kidney disease and hypertension, non-smokers, and obese participants. This research provides health educators and doctors that need to be trained with knowledge of chronic kidney disease to raise health understanding.

15. Kristina SA, Ekasari MP, Wati MR (2019) Internet use for searching information on Health and Medicine: An Exploratory study among Indonesian customers. *Res. J. Pharm. Technol.*, 12(12):5927.
16. Diaz-Quijano FA, Martínez-Vega RA, Rodriguez-Morales AJ, Rojas-Calero RA, Luna-González ML, Díaz-Quijano RG (2018) Association between the level of education and knowledge, attitudes and practices regarding dengue in the Caribbean region of Colombia. *BMC Public Health.*, 18(1):143.
17. Stanifer JW, Turner EL, Egger JR, Thielman N, Karia F, Maro V, et al (2016) Knowledge, Attitudes, and Practices Associated with Chronic Kidney Disease in Northern Tanzania: A Community-Based Study. Nugent RA, editor. *Plos ONE*, 11(6):e0156-336.
18. Ng CY (2016) Cross-sectional study on knowledge of chronic kidney disease among medical outpatient clinic patients. *Med. J. Malaysia*, 71(3):6.
19. Yuan F, Qian D, Huang C, Tian M, Xiang Y, He Z, et al (2015) Analysis of awareness of health knowledge among rural residents in Western China. *BMC Public Health*, 1: 55.
20. He Z, Cheng Z, Shao T, Liu C, Shao P, Bishwajit G, et al (2016) Factors Influencing Health Knowledge and Behaviors among the Elderly in Rural China. *Int. J. Environ. Res. Public Health.*, 13(10):975.
21. Peprah P, Abalo EM, Agyemang-Duah W, Gyasi RM, Reforce O, Nyonyo J, et al (2019) Knowledge, attitude, and use of mHealth technology among students in Ghana: A university-based survey. *BMC Med Inform Decis Mak.*, 19(1):220.
22. McClellan WM, Satko SG, Gladstone E, Krisher JO, Narva AS, Freedman BI (2009) Individuals With a Family History of ESRD Are a High-Risk Population for CKD: Implications for Targeted Surveillance and Intervention Activities. *Am J. Kidney Dis.*, 53(3):S100-6.
23. Monhart V (2013) Hypertension and chronic kidney diseases. *Cor Vasa.*, 55(4): e397-402.
24. Rhee CM, Ahmadi S-F, Kalantar-Zadeh K (2016) The dual roles of obesity in chronic kidney disease: a review of the current literature. *Curr Opin Nephrol Hypertens*, 25(3):208-16.
25. Yang J, Hammond D, Driezen P, Fong GT, Jiang Y (2010) Health knowledge and perception of risks among Chinese smokers and non-smokers: findings from the Wave 1 ITC China Survey. *Tob Control*, 19(2):i18-23.
26. Minh An DT, Van Minh H, Huong LT, Bao Giang K, Thanh Xuan LT, Thi Hai P, et al (2013) Knowledge of the health consequences of tobacco smoking: a cross-sectional survey of Vietnamese adults. *Glob Health Action*, 6(1):18707.