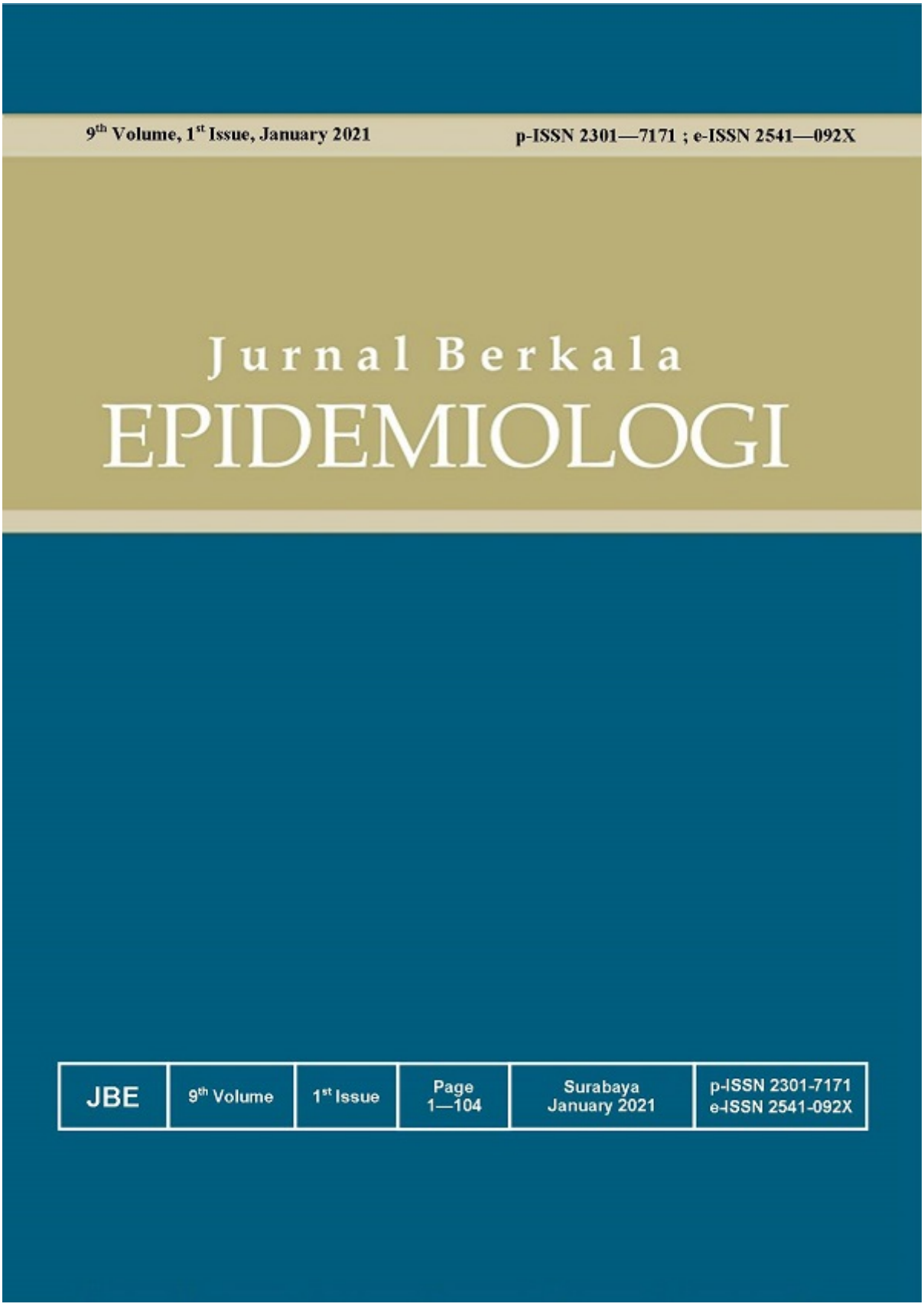

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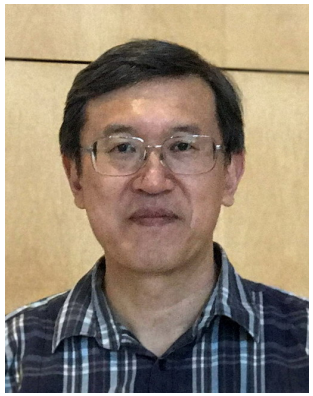

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ORIGINAL RESEARCH

DIABETES, HYPERTENSION, OBESITY, AND SMOKING AS RISK FACTORS FOR CHRONIC KIDNEY DISEASE IN PRODUCTIVE AGE

Diabetes, Hipertensi, Obesitas, dan Merokok Sebagai Faktor Risiko Penyakit Ginjal Kronis pada Usia Produktif

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ABSTRACT

Background: Based on the Indonesia basic health research report in 2018, the prevalence of chronic kidney disease (CKD) in the productive age group in Indonesia had increased from the previous year, to 1.97%. This condition can cause various complications that contribute to the high morbidity, which affects quality of life and productivity, so risk factors for CKD need to be understood to prevent the occurrence of the disease. **Purpose:** This study aimed to analyze the risk factors associated with CKD in the Indonesian productive-age population. **Method:** This study used data sourced from Indonesian Family Life Survey 5 (IFLS-5) with a cross-sectional research design. The study population was composed of all Indonesian residents who were respondents of IFLS-5. The research sample was made up of respondents aged 15–64 for whom complete information was available. The sample size was 29,120 respondents. The variables analyzed in this study were diabetes, hypertension, obesity, smoking, and CKD. The analysis method used was the chi-square test. **Results:** Bivariate analysis showed a significant relationship between CKD and diabetes (p = 0.01; prevalence ratio [PR] = 2.71; 95% CI = 1.74–4.22), hypertension (p = 0.01; PR = 2.62; 95% CI = 2.08–3.30), obesity (p = 0.01; PR = 1.67; 95% CI = 1.25–2.23), and smoking (p = 0.01; PR = 1.43; 95% CI = 1.17–1.75) in the productive age group in Indonesia. **Conclusion:** Diabetes, hypertension, obesity, and smoking have a significant relationship with CKD in the productive age group in Indonesia.

ABSTRAK

Latar Belakang: *Berdasarkan laporan Riset kesehatan dasar tahun*

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2018, prevalensi penyakit ginjal kronis (PGK) pada usia produktif di Indonesia mengalami peningkatan dari tahun sebelumnya menjadi 1,97%. Kondisi ini dapat menimbulkan berbagai komplikasi yang berkontribusi pada tingginya angka kesakitan yang berdampak pada kualitas hidup dan produktivitas, sehingga faktor risiko PGK perlu dipahami untuk mencegah terjadinya penyakit. ***Tujuan:*** *Penelitian ini bertujuan untuk menganalisis faktor risiko yang berhubungan dengan penyakit ginjal kronis pada usia produktif di Indonesia.* ***Metode:*** *Penelitian ini menggunakan data yang bersumber dari Indonesian Family Life Survey 5 (IFLS-5) dengan desain studi cross sectional. Populasi penelitian yaitu seluruh penduduk Indonesia yang menjadi responden IFLS- 5. Sampel penelitian yaitu responden berusia 15 tahun sampai 64 tahun yang memiliki informasi yang lengkap. Besar sampel berjumlah 29.120 responden melalui metode total sampling yang memenuhi kriteria inklusi. Variabel yang akan di analisis dalam penelitian ini adalah diabetes, hipertensi, obesitas, merokok, dan kejadian PGK. Analisis yang digunakan adalah uji chi square.* ***Hasil:*** *Analisis bivariat menunjukkan adanya hubungan yang signifikan antara PGK dan diabetes (p=0,01; Prevalence Rate [PR]=2,71; 95% CI=1,74-4,22), hipertensi (p=0,01; PR=2,62; 95% CI=2,08-3,30), obesitas (p=0,01; PR=1,67; 95% CI=1,25-2,23), dan merokok (p=0,01; PR=1,43; 95%CI=1,17-1,75) pada usia produktif di Indonesia.* ***Kesimpulan:*** *Diabetes, hipertensi, obesitas, dan merokok memiliki hubungan yang signifikan dengan kejadian penyakit ginjal kronis pada usia produktif di Indonesia.*

INTRODUCTION

Chronic kidney disease (CKD) is a disease characterized by a decline in renal function, specifically by a glomerular filtration rate of <60 mL/min per 1.73 m^2 (Webster, Nagler, Morton, & Masson, 2017). This condition lasts for approximately three months (Fraser & Blakeman, 2016). If the situation continues, it will cause several complications such as cardiovascular disease, anemia, mineral bone disorder, water and salt retention, metabolic acidosis, electrolyte disturbances, and the onset of symptoms of uremia. These complications contribute to high morbidity and mortality rates and reduce patients' quality of life (Bello et al., 2017).

The condition of CKD varies in severity, and treatment has been shown to slow its progression. When the kidneys stop working, it is necessary to have dialysis or a kidney transplant (Fraser & Blakeman, 2016). Both of these actions incur high costs. People suffering from CKD can also experience a decrease in quality of life (Suwanti, Taufikurrahman, Rosyidi, & Wakhid, 2017).

In 2016, kidney disease was ranked 12th out of the 20 most prevalent causes of death in the world, with a crude death rate (per 100,000 population) of 15.80. Deaths from kidney failure have increased globally since 2000. In 2000, kidney disease was the 18th most prevalent disease in the world for mortality rates, with a CDR value of 11.80. Almost all cases of death due to kidney disease result from CKD (WHO, 2018). Projections of the number of potential cases of CKD in late stages or deaths from CKD increase in countries with low or medium income levels; i.e., in countries with high growth of obesity and diabetes (Neuen, Chadban, Demaio, Johnson, & Perkovic, 2017). The highest reported prevalence levels of chronic kidney disease in the world are in Asia (Stanifer, Muiru, Jafar, & Patel, 2016). The prevalence of kidney disease in Indonesia increased from 0.20% in 2013 to 0.38% in 2018 (Ministry of Health RI, 2019).

Based on a report by the Indonesian Renal Registry Team (2017), the number of patients aged 35–64 years who undergo hemodialysis in Indonesia has increased. Diagnosis records of new patients undergoing hemodialysis showed that 90% were cases of CKD. The 35–64 age group is included in the productive age category (total productive age range = 15–64). In this age range,

people are considered capable of creating goods and services and are able to finance the lives of people who are not yet productive (age <15 years) and who are unproductive (>64 years) (Sukmaningrum & Imron, 2017). The proportion of the productive age population in Indonesia tends to increase from year to year, as does the prevalence of CKD in this age group, which showed an increase from 2013 to 2018 (Ministry of Health RI, 2019). This could be influenced by several major risk factors that can cause CKD, including diabetes and hypertension, which have a relationship with the aging process—as age increases, the risk of diabetes and hypertension will increase (Centers for Disease Control and Prevention, 2019).

Hypertension was the primary cause of stage 5 CKD in Indonesia in 2018, with a presentation of 36%, and diabetes was the second most prevalent cause (28%) (Indonesian Renal Registry Team, 2017). In a study conducted by Farida, Thaha, & Susanti (2018) in the dialysis unit of the Dr. Soetomo Hospital with patients with stage 5 CKD, as many as 28.60% of respondents had smoking habits. Meanwhile, Anthoni, Supriyadi, & Fatimah (2019) found that 53% of their respondents with CKD also suffered from obesity.

Studies on CKD have been conducted previously; however, existing studies have focused on only one place or area of research, with a limited number of respondents. The current research is expected to be representative of all sufferers of CKD in the productive age group in Indonesia. This study aimed to analyze the risk factors that have a relationship with the incidence of CKD in the productive age group (15–64) in Indonesia.

METHODS

This research was conducted as an observational analytic study with a cross-sectional design. The data analyzed in this study were secondary data sourced from the Indonesian Family Life Survey 5 (IFLS-5), which was conducted in 2014–2015. The population of the current study consisted of all Indonesian residents from the provinces of North Sumatra, West Sumatra, South Sumatra, Lampung, DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, Bali, West Nusa Tenggara, South Kalimantan, and South Sulawesi who were respondents of IFLS-5 (RAND Corporation, 2015). The researchers used a total sample of 29,120 respondents for whom complete information was available (Figure 1).

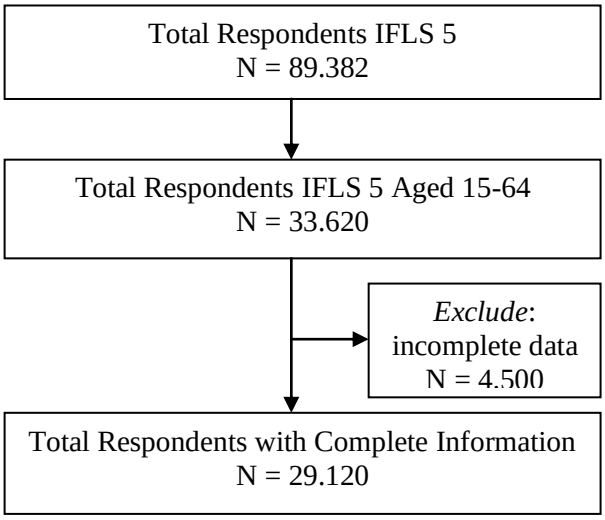

Figure 1. Research Sample Selection from IFLS-5 Respondents

The dependent variable in this study was CKD, and the independent variables consisted of diabetes, hypertension, obesity, and smoking. The variables of chronic failure, diabetes, and hypertension were categorized into two options: "Yes" and "No." The variable of respondents' age was grouped into five categories: 15–24 years old, 25–34 years old, 35–44 years old, 45–54 years old, and 55–64 years old. The gender of the respondents was categorized into two groups: male and female. The obesity variable was determined through the results of measurements of body mass index (BMI), with a respondent categorized as "obese" if their BMI was ≥30 kg/m^2 and "not obese" if their BMI was <30 kg/m^2 (Wimmelmann et al., 2018). The smoking variable was determined through the responses to two questions listed in the IFLS-5, which are related to smoking habits and length of smoking.

The data collected were then processed and analyzed using univariate analysis in the form of frequency distribution and bivariate analysis using a chi-square statistical test with a significance level of 0.05. A prevalence ratio (PR) calculation was applied to calculate the magnitude of the disease problem. All data processing and analysis procedures were carried out using Stata 15 software. This study received research ethics approval from the Research Ethics Commission of the Faculty of Dentistry of Universitas Airlangga (# 002 / HRECC.FODM / I / 2020), and approval was received to access secondary data from the IFLS. The IFLS survey was approved by the

ethical review board of RAND and Universitas Gajah Mada in Indonesia.

RESULTS

Characteristics of the Respondents

Most of the respondents were in the 25–34 age group (8,396 people; 28.83%). Most of the respondents were female (15,336 people; 52.66%) (Table 1). Table 2 shows that the prevalence of CKD occurring at productive age was 1.33%. The majority of patients with chronic kidney failure were in the 35–44 age group (27.13%), and more were male (58.66%) than female (Table 2).

Table 1
Age Group and Gender Characteristics of Productive Age Respondents in Indonesia

Variables	Frequency (n)	Percentage (%)
Age		
15 – 24	6.871	23.60
25 – 34	8.396	28.83
35 – 44	6.842	23.50
45 – 54	4.361	14.98
55 – 64	2.650	9.10
Sex		
Male	13.784	47.34
Female	15.336	52.66
Total	29.120	100.00

Table 2
Age Group and Gender Characteristics of Productive Age Respondents in Indonesia Suffering from Chronic Kidney Disease

Variable	Frequency (n)	Percentage (%)
Age		
15 – 24	40	10.34
25 – 34	83	21.45
35 – 44	105	27.13
45 – 54	92	23.77
55 – 64	67	17.31
Sex		
Male	227	58.66
Female	160	41.34
Total	387	100.00

Relationship of Diabetes with Chronic Kidney Disease at Productive Age

Table 3 shows that 5.17% of the respondents who suffered from CKD also suffered from diabetes. The chi-square test results returned a p-value of 0.01 ($p < 0.05$), indicating a significant relationship between diabetes and CKD in the productive age population in Indonesia. The PR result of 2.71 (95% CI = 1.74–4.22) indicates that respondents with diabetes were 2.71 times more likely to develop CKD than those who did not have diabetes.

Relationship of Hypertension with Chronic Kidney Disease at Productive Age

Table 3 shows that 23.51% of the respondents who suffered from CKD also suffered from hypertension. The chi-square test results gave a p-value of 0.01 ($p < 0 .05$), indicating a significant relationship between hypertension and CKD in the productive age population in Indonesia. The PR value of 2.62 (95% CI = 2.08–3.30) means that respondents with hypertension were 2.62 times more likely to have also developed CKD compared with those who did not suffer from hypertension.

Relationship of Obesity with Chronic Kidney Disease at Productive Age

Table 3 shows that 13.28% of respondents who suffered from CKD were categorized as obese. The chi-square test results gave a p-value of 0.01 ($p < 0.05$), indicating a significant relationship between obesity and CKD in the productive age population in Indonesia. The PR result of 1.67 (95% CI = 1.25–2.23) shows that obese respondents were 1.67 times more likely to develop CKD compared with those who were not obese.

Relationship of Smoking with Chronic Kidney Disease at Productive Age

Table 3 shows that 39.79% of the respondents with CKD had smoking habits. The chi-square test results returned a p-value of 0.01 ($p < 0.05$), indicating a significant relationship between smoking and CKD. The PR value of 1.43 (1.17–1.75) shows that respondents who smoked were 1.43 times more likely to develop CKD than those who did not smoke.

DISCUSSION

Characteristics of the Respondents

The majority of patients with CKD were in the 35–44 age group. This indicates that CKD can occur at productive age. Research conducted by Ariyanto et al (2018) found that risk factors that can cause CKD in people <50 years old were eating behaviors (such as consumption of energy supplement drinks >4 times per week), smoking

≥10 cigarettes per day, and consumption of herbal medicines >4 times per week.

The majority of the respondents with CKD were male, even though the respondent sample was dominated by women. This proves that CKD affects a high proportion of men. This is in accordance with Pranandari and Supadmi's (2015) finding that men are clinically at a 2x higher risk than women. Due to severity, CKD in men develops more rapidly into end-stage kidney disease than it does in women. Men also experience a lower glomerular filtration rate than women (Cobo et al., 2016).

Relationship between Diabetes and Chronic Kidney Disease at Productive Age

This study's results show that the respondents with diabetes were 2.71 times more likely to suffer from CKD compared with those who did not have diabetes. This is in line with research conducted by Sulistiowati and Idaiani (2015) in the 25–65-year-old population in Bogor, which showed that respondents with diabetes had a 2.5x higher risk of developing CKD than those without diabetes. This could be because, in individual with diabetes, the kidneys work harder to filter high blood sugar levels, which then causes leakage. At the beginning of the leakage, albumin protein will be excreted in the urine. Furthermore, when the kidney condition worsens, there will be a decrease in kidney function (Pongsibidang, 2017).

According to Salman et al. (2018), diabetes is the leading cause of CKD in developing countries (37.50%). This is due to several factors, including ethnic and socio-economic differences and the varying quality of health services between urban and rural areas.

Globally, diabetes is responsible for 40% of new end-stage renal disease cases, making it the single leading cause of kidney failure. It is estimated that one in every three adults with diabetes suffers from CKD, and most of them are not aware of it. This is because morbidity risk factors occur simultaneously (Koye et al., 2018).

Patients with CKD and diabetes need attention in terms of various aspects of treatment. The most important action to prevent complications is to optimize glycemic control. Development of nephropathy screening also needs to be carried out regularly to monitor micro albuminuria or decreases in glomerular filtration rate (Hahr & Molitch, 2015).

Relationship between Hypertension and Chronic Kidney Disease at Productive Age

The results of this study showed a significant relationship between hypertension and CKD. This is in line with research conducted by Sulistiowati and Idaiani (2015) in Bogor, which showed that hypertension has a significant relationship (p = 0.00) with the incidence of CKD. The results of the current study also indicate that respondents with hypertension had a 3.71x greater risk of experiencing CKD than those who did not have hypertension. This is in line with Pranandari and Supadmi's (2015) finding that respondents with hypertension have a 4.04x greater risk of experiencing CKD than those who don't.

Table 3
Chi-Square Statistical Test Results for Relationship of Diabetes, Hypertension, Obesity, and Smoking with Chronic Kidney Disease at Productive Age in Indonesia

Variable	Chronic Kidney Disease				Total		p value	PR (95% CI)
	Yes		No					
	n	%	n	%	n	%		
Diabetes								
Yes	20	5.17	554	1.93	574	1.97	0.01	2.71 (1.74–4.22)
No	367	94.83	28,179	98.07	28546	98.03		
Hypertension								
Yes	91	23.51	2,968	10.33	3059	10.50	0.01	2.62(2.08–3.30)
No	296	76.49	25,765	89.67	26061	89.50		
Obesity								
Yes	51	13.18	2,376	8.27	2427	8.33	0.01	1.67 (1.25–2.23)
No	336	86.82	26,357	91.73	26693	91.67		
Smoking								
Yes	154	39.79	9,035	31.44	9189	31.56	0.01	1.43 (1.17–1.75)
No	233	60.21	19,698	68.56	19931	68.44		
Total	387	100.00	28,733	100.00	29,120	100.00		

Hypertension can cause pressure on the blood vessels of the kidneys, and thus will cause a decrease in kidney function, leading to kidney failure if occurs over a long time period. Hypertension that lasts for a long time thus increases the risk for CKD (Pongsibidang, 2017). Efforts to reduce blood pressure in patients with CKD are carried out to slow the progression of the disease (Pugh, Gallacher, & Dhaun, 2019). A low-salt diet and diuretic therapies that suit the individual's needs are the right treatments for hypertension in patients with CKD (Judd & Calhoun, 2015).

Relationship between Obesity and Chronic Kidney Disease at Productive Age

The accumulation of excess fat in the body can cause the health problem called obesity. During adulthood, a person is categorized as obese if their BMI value is ≥30 kg/m^2. Kidney diseases such as CKD, nephrolithiasis, and kidney cancer are among the effects of obesity (Kovesdy, Furth, Zoccali, & World Kidney Day Steering Commitee, 2017).

This research shows that there is a relationship between obesity and CKD. The results also show that respondents who were obese were at 1.67x greater risk of developing CKD than those who were not. This is in line with the study conducted by Sulistiowati & Idaiani (2015), which showed that obesity has a significant relationship (p = 0.01) with the incidence of CKD. Their results also showed that respondents with obesity were at 2.51x greater risk of developing CKD than those who were not. The epidemic of obesity around the world affects the human population in many ways. Kidney problems such as CKD, nephrolithiasis, and kidney cancer can be a result of obesity, and they have the potential to lead to morbidity and mortality. Therefore, obesity control (weight loss) interventions are required to prevent or delay the development of CKD (Kovesdy, Furth, Zoccali, & World Kidney Day Steering Commitee, 2017).

The Relationship Between Smoking and Chronic Kidney Disease at Productive Age

Smoking has a significant influence on health problems. It is estimated to cause the premature deaths of around 6 million people annually worldwide. Early death due to smoking is defined as death caused by a disease that is related to smoking. The average early death from smoking causes ten years of life lost. Many premature deaths from smoking occur in people who have stopped smoking but have still seen their health condition deteriorate due to previous smoking habits. This deterioration also happens to smokers who do not stop smoking. People with the habit of smoking in old age will suffer from smoking-related diseases ten years earlier than people who do not smoke (West, 2017).

This study's results indicate a relationship between smoking and the occurrence of CKD, with respondents who smoked being at 1.43x greater risk than those who did not. These findings are in line with those of Xia et al (2017), who reported a significant relationship between smoking and CKD (p = 0.00; CI = 1.23–1.47) (1.34x greater risk of developing CKD for smokers than non-smokers). Jhee et al (2019) argue that passive smoking is also associated with an increase in the prevalence and development of CKD incidence, with passive smokers being at 1.48x greater risk than those who are not exposed to cigarette smoke.

Smoking has a negative effect on general health problems; therefore, prevention efforts are needed. Anti-tobacco campaigns can substantially increase negative attitudes about smoking, reduce smoking initiation among teenagers, and promote the cessation of smoking among active smokers. Increasing taxes on tobacco products can also reduce consumption of these products, especially by young people (Van Laecke & Van Biesen, 2017).

CONCLUSION

The majority of respondents in this study were 25–34 years old, and there were more female than male respondents. The results indicate that the prevalence of CKD in the productive age is 1.33%, with the highest prevalence among 35–44-year-old males. Based on the study findings, diabetes, hypertension, obesity, and smoking are risk factors for CKD among the productive age population in Indonesia.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

AUTHOR CONTRIBUTION

RS and AH contributed equally during the conceptualization and final approval of this study. RS took part in the methodology, data curation, formal analysis, and writing of the original draft. AH took part in reviewing, editing, and revision.

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