Factors Related to the Prevalenceof Chronic Kidney Disease in Indonesia:An Ecological Study

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Abstract

Previous research has found that the cost of chronic kidney disease is relatively high. This study aims to ecologically analyze the factors relatedto the prevalence of chronic kidney disease in Indonesia.The research conduct ecological analysis using secondary data from the Ministry of Health of the Republic of Indonesia report in 2018. The study takes all provinces as samples. Apart from chronic kidney disease, four other variables analyzed as independent variables were the adherence to taking antihypertensive drugs, dedication to taking anti-diabetic drugs/injections, a habit of drinking soft drinks > 1 time/day, a habit of drinking energy drinks> 1 time/day. Data were analyzed usinga scatter plot.The results showed that the higher the percentage of adherence to taking antihypertensive drugs in a province, the higher the prevalence of chronic kidney disease. The higher the percentage of commitment to taking anti-diabetes medications/injections in a section, the lower the prevalence of chronic kidney disease. The higher the rate of drinking soft drinks>1 timea day, the higher the prevalence of chronic kidney disease. The higher the percentage of regular drinking energy drinks>1 timea day, the higher the prevalence of chronic kidney disease.The study concluded that five independent variables analyzed were related to Indonesia's prevalence of chronic kidney diseases.

Keywords: *ecological analysis, secondary data, chronic kidney disease, food habit.*

Background

Chronic Kidney Disease (CKD) is a condition where the kidneys are damaged or the glomerular filtration rate (GFR) <60 mL/minute within three months or more. Early-stage chronic kidney disease often goes undiagnosed. In contrast, end-stage chronic kidney disease, also known as kidney failure, requires very high treatment and handling costs for hemodialysis or kidney transplant. The stages of chronic kidney disease based on GFR are[1]:

1. Stage 1: GFR value >90, meaning kidney damage with average/increased GFR value
2. Stage 2: GFR 60-89, meaning kidney damage with a mild decrease in GFR
3. Stage 3: GFR value 30-59, meaning kidney damage with a moderate decrease in GFR
4. Stage 4: GFR value 15-29, meaning kidney damage with a severe decrease in GFR
5. Stage 5: GFR value <15, meaning that the patient has experienced kidney failure

The 2015 Global Burden Disease (GBD) Study estimated that 1.2 million people died from kidney failure, an increase of 32% since 2005. In 2010, an estimated 2.3–7.1 million people died of end-stage kidney disease without dialysis. The estimated number of disability-adjusted life-years (DALYs) of kidney disease globally increased from 19 million in 1990 to

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33 million in 2013. Kidney disease is associated with a tremendous economic burden. High-income countries typically spend more than 2-3% of their health budget on end-stage kidney disease treatment. In 2010, 2.62 million people received dialysis worldwide, and the need for dialysis is projected to double by 2030. In 2015, in the United States, Medicare spending on chronic kidney disease was more than 64 billion[2].

Based on the 2018 census, Indonesia's total population is 265,015,313 people, consisting of 133,136,131 male residents and 13,879,182 female residents. Based on data from the Ministry of Health, in 2017, the Healthy Life Expectancy (HALE) rate in Indonesia only reached 62.7 years, while the life expectancy in the same year was 71.5 years. The condition means that there is a gap of 8.8 years compared to AHH/LE. With increasing age, physiological function decreases due to degenerative processes so that non-communicable diseases often appear in the elderly. Results of the 2018 Indonesia Basic Health Survey, diseases that mostly suffer from the elderly are hypertension 63.5%, dental problems 53.6%, joint disease 18%, oral problems 17%, diabetes mellitus 5.7%, heart disease 4.5%, stroke 4.4%, kidney failure 0.8% and cancer 0.4%[3].

Chronic Kidney Disease in Indonesia has increased from 0.2% in 2013 to 0.38% in 2018. The number of people with kidney disease in 2018 reached 713,783 people, and the largest proportion was in North Kalimantan province, as much as 0.64%[3]. Although the prevalence of chronic kidney disease is only 0.38%, it consumes 1 to 1.6% of national health spending. In 2014, BPJS paid claims for chronic kidney disease for IDR 2.2 trillion, and in 2015 it increased to IDR 2.7 trillion[4]. Several risk factors associated with the occurrence of chronic kidney disease include, among others: consumption patterns of several types of drinks, diabetes mellitus, hypertension, kidney stones, and others[5].Early detection and prevention of chronic kidney disease risk need to be increased to reduce the prevalence and state expenditure on chronic kidney disease. The government has conveyed several efforts to prevent chronic kidney disease, namely by implementing "*CERDIK*" behavior (regular/periodic health checks, Get rid of cigarette smoke, Be diligent in physical activity, A healthy diet with balanced calories, Adequate rest, and Stress management)[6]. Based on the background description, the authors conduct a study to analyzeIndonesia's ecological factors associated with chronic kidney disease prevalence.

Materials and Methods

The authors' design study using an ecological analysis approach. Ecological studies focus on comparisons between groups, not individuals. The data analyzed is aggregate data at a particular group or level, which in this study is the provincial level. Variables in ecological analysis can be in aggregate measurement, environmental measurement, or global measurement[7,8].

This research uses report data taken from the Indonesian Basic Health Research 2018 and the Indonesian Health Profile 2018, an official report issued by the Republic of Indonesia's Ministry of Health. Both reports can be downloaded on the page http://www.depkes.go.id. The unit of analysis in this study is the province. A total of 34 provinces in Indonesia were used in the analysis of this study.

The dependent variable in this study is the prevalence of chronic kidney disease in Indonesia. Meanwhile, the independent variables analyzed were adherence to taking antihypertensive drugs, adherence to taking/injecting anti-diabetic drugs, drinking soft drinks>1 time/day, and the habit of drinking energy drinks>1 time/day.

The percentage of chronic kidney disease is the percentage of the population diagnosed with chronic kidney disease by doctors at the age> 15 years. Adherence to taking antihypertensive drugs is the percentage of taking the drugs every day in people aged> 18 years with a diagnosis of hypertension. Adherence to taking anti-diabetic drugs/ injections is the percentage of taking anti-diabetic drugs/injections at all ages with a diagnosis of diabetes mellitus. The habit of drinking soft drinks>1 time/day is the percentage of drinking soft drinks or carbonated drinks>1 time/day for people aged> 3 years. The habit of drinking energy drinks>1 time/day is the percentage of drinking energy drinks>1 time/day for people aged> 3 years.

The study was conducted by utilizing secondary data from published reports. For this reason, ethical clearance is not required in the implementation of this study. The data were analyzed bivariate using a scatter plot to see the trend.

Results and Discussion

Table 1 shows the descriptive statistics of the five variables analyzed in this study. The highest proportion of the population diagnosed with chronic kidney disease was North Kalimantan, as much as 0.64%, while the lowest was West Sulawesi (0.18%).

Table 1. Descriptive statistics All Variables

Descriptive Statistics	Prevalence ofchronic kidney disease	Adherence to taking antihypertensive drugs	Adherence to taking anti-diabetes drugs	Habit of drinking soft drinks	Habit of drinking energy drinks
N	34	34	34	34	34
Mean	0.39	54.13	91.66	2.66	2.31
Median	0.40	54.88	91.60	2.30	1.85
Mode	0.32a	43.35a	86.98a	2.20	1.20a
Std. Deviation	0.10	5.78	2.69	1.14	1.40
Variance	0.01	33.37	7.25	1.30	1.97
Range	0.46	21.16	11.68	5.00	5.50
Minimum	0.18	43.35	86.98	1.30	1.00
Maximum	0.64	64.51	98.66	6.30	6.50

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile.

Figure 1 shows the scatter plot of the prevalence of chronic kidney disease and the percentage of adherence to taking antihypertensive drugs. The picture shows the relationship between the two variables showing a positive trend. This condition means that the higher the percentage of adherence to taking antihypertensive drugs in a province, the higher the prevalence of chronic kidney disease.

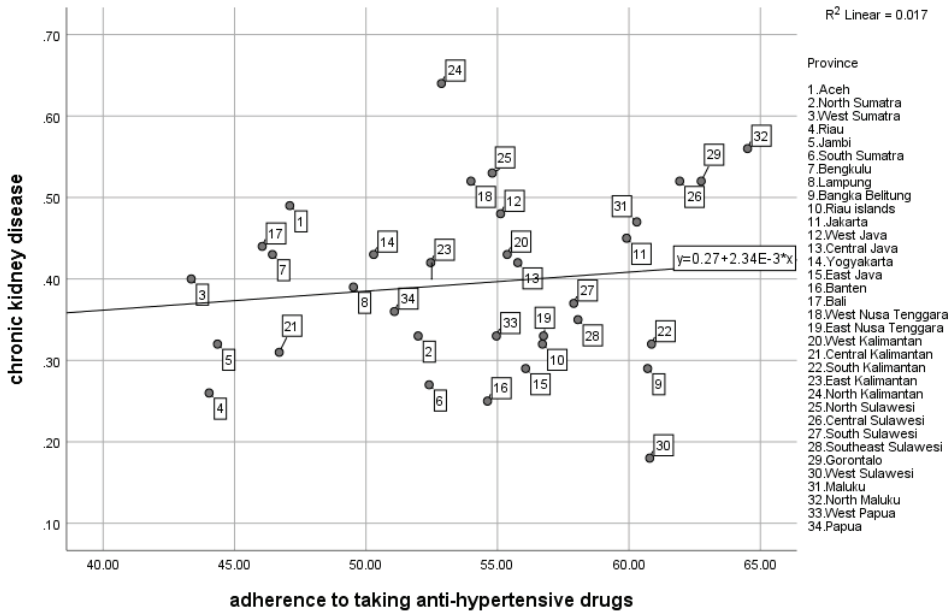

Figure 1. Scatterplot prevalence of chronic kidney disease and the percentage of adherence to taking antihypertensive drugs in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

In contrast to previous studies comparing groups who were not adherent to hypertension treatment versus those adherents to treatment, there was a greater risk of developing chronic kidney disease (hazard ratio 1.27, 95% CI 1.05-1.54)[9]. Adherence to taking hypertension drugs that is not optimal increases the risk of end-stage chronic kidney disease[10]. The study's difference could occur because the data obtained were secondary data regarding adherence to taking antihypertensive drugs. The drugs used were not explained in detail yet, the degree of hypertension and when to start taking hypertension drugs.

Figure 2 shows the scatter plot of the prevalence of chronic kidney disease and the percentage of adherence to taking anti-diabetes drugs/injections. The picture shows the relationship between the two variables showing a negative trend. This condition means that the higher the percentage of compliance with taking anti-diabetes drugs/ injections in a province, the lower the prevalence of chronic kidney disease.

Lack of blood sugar control increases the rate of progression of kidney failure. The UK Prospective Diabetes Study provides the first evidence that intensive glycemic control, more aggressive therapy, and medical monitoring and follow-up are combined.The treatment can reduce long-term complications caused by type 2 diabetes, such as chronic kidney disease[11]. Diabetes drugs such as metformin have a renoprotective effect that can prevent chronic kidney disease in diabetes patients[12]. The results of previous studies showed that there was a significant relationship between glycemic control using the Glycated-Albumin parameter and the incidence of CKD (p 0.003; OR 1.75 CI 95% 0.92-3.32), which means the possibility of patients with poor glycemic control. Compared to patients with good glycemic control for chronic kidney disease is 1.75 or it can also be stated that poor glycemic control can increase the likelihood of chronic kidney disease incidence by 63.64%[13].

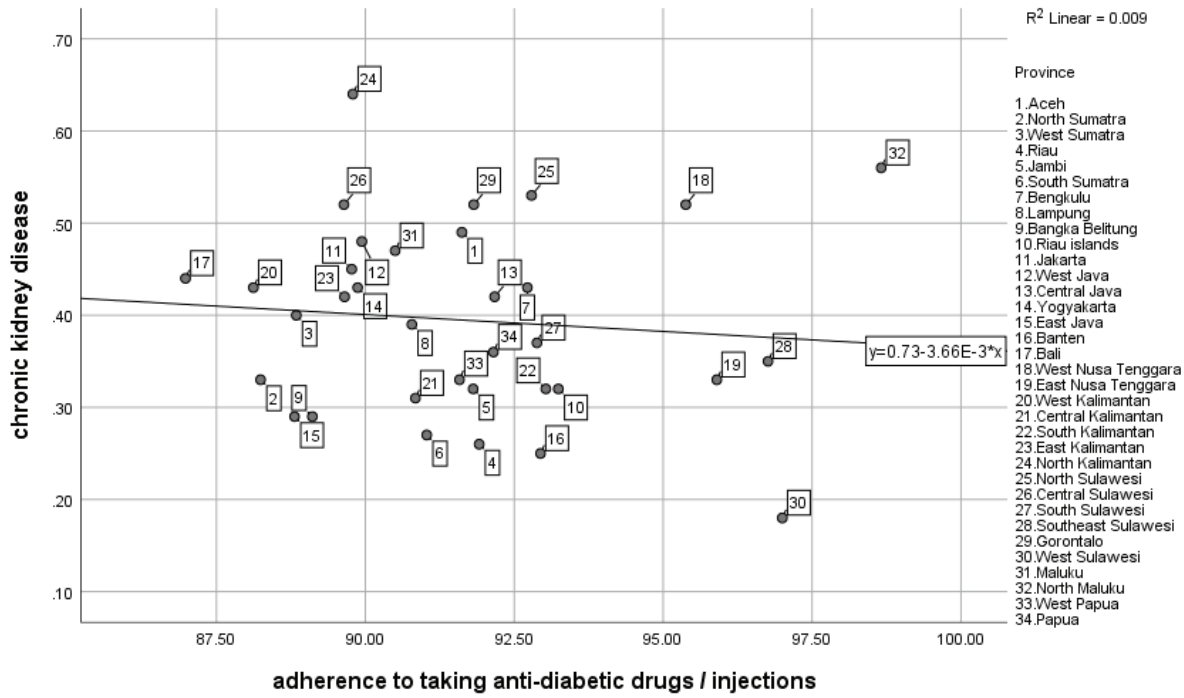

Figure 2. Scatter plot prevalence of chronic kidney disease and the percentage of adherence to taking anti-diabetes drugs/injections in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Figure 3 shows the scatter plot results of chronic kidney disease prevalence and the percentage of habitual drinking soft drinks >1 time/day. The picture shows the relationship between the two variables showing a positive trend. This condition means that the higher the percentage of drinking soft drinks >1 time/day in a province, the prevalence of chronic kidney disease is also getting lower.

The result is consistent with previous studies that showed a statistically significant association between drinking soft drinks and chronic kidney disease (OR 1.19; 95% CI 1.05 to 1.35). A habit of drinking high soft drinks has a 2,5% higher risk of developing chronic kidney disease than those who have a habit of drinking low soft drinks (OR 0.03; 95% CI 0.00 to 0.05)[14]. Other studies have shown that consumption of cola drinks sweetened with sugar ≥ 1 unit (glass/bottle/can) per day has the risk of causing kidney stones 23% higher than those who consume < 1 unit/week[5].

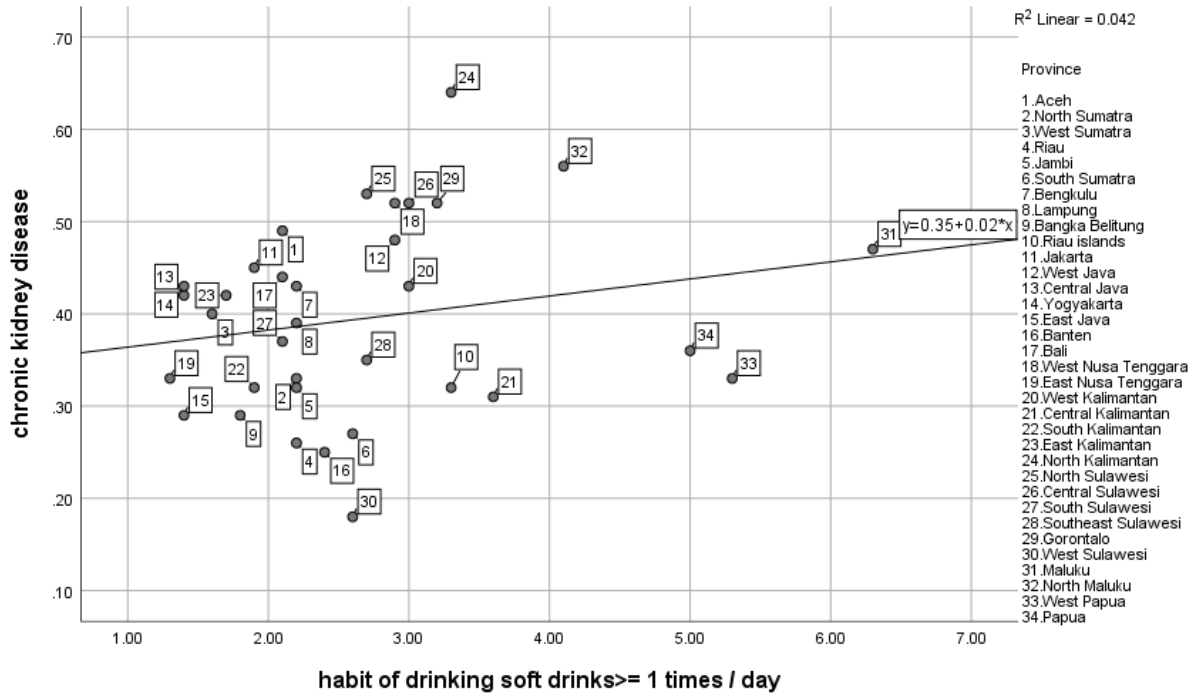

Figure 3. Scatter plot of chronic kidney disease prevalence and percentage of the habit of drinking soft drinks > 1 time/day in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

Figure 4 shows the results of a scatter plot of the prevalence of chronic kidney disease and the percentage of habitual drinking energy drinks >1 time/day. The picture shows the relationship between the two variables showing a positive trend. This condition means that the higher the percentage of drinking soft drinks >1 time/day in a province, the prevalence of chronic kidney disease is also getting lower.

The result is consistent with previous research, which shows that there is a relationship between the habit of drinking energy drinks >1 time/day increases the risk of developing chronic kidney disease by 25.81 times (p = 0.0001)[5].Other studies have also shown that consuming energy drinks is more at risk of developing chronic kidney disease (p = 0.001). Based on the results of the research analysis, the OR = 11.492 was also obtained. This value shows that respondents who consume energy drinks ≥3 times/week are 11.49 times more likely to experience chronic kidney failure than respondents who consume energy drinks <3 times/week[15].

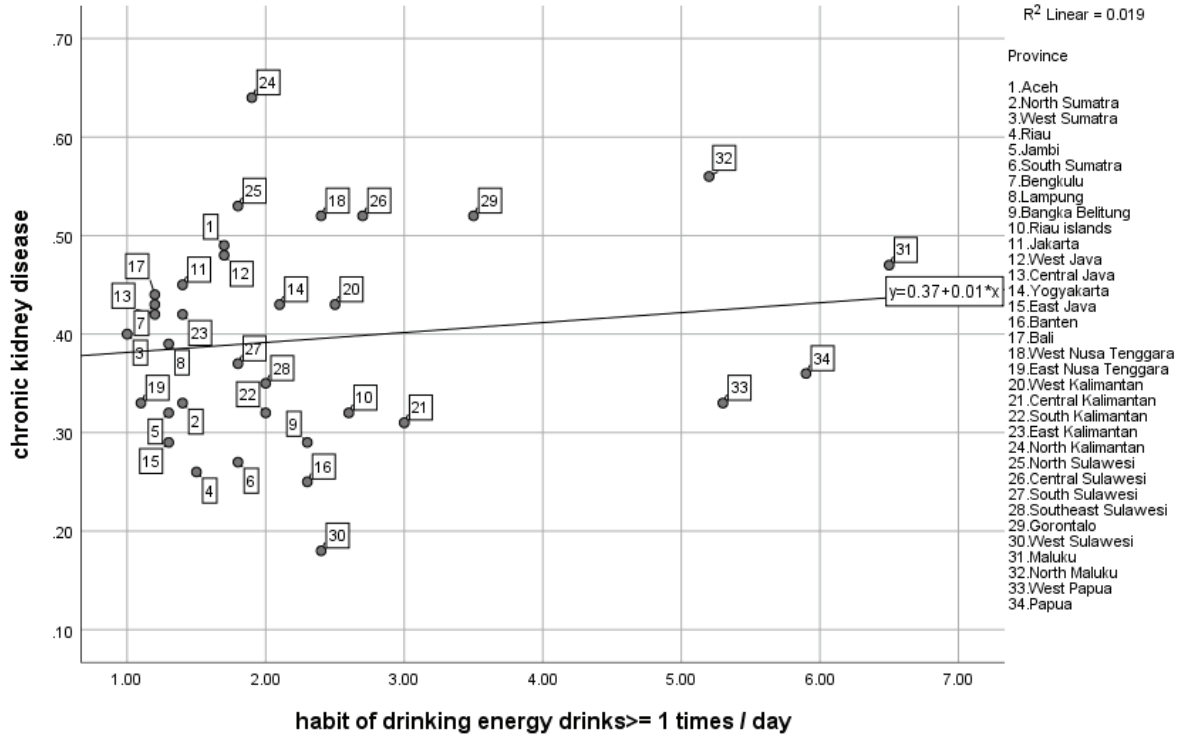

Figure 4. Scatter plot of the prevalence of chronic kidney disease and the percentage of the habit of drinking energy drinks>1 time/day in Indonesia in 2018

Source: The 2018 Indonesia Basic Health Survey and The 2018 Indonesia Health Profile

The research was conducted with an ecological analysis approach with limitations in its use as a policy basis because the data used is aggregate data at the provincial level[16]. Further research at the individual level is needed to obtain more accurate information.

Conclusions

Based on the study results, the authors concluded that there are three variables related to chronic kidney disease in Indonesia. The three arethe percentage of adherence to taking antihypertensive drugs, drinking soft drinks> 1 time/day, and the habit of drinking energy drinks> 1 time/day. Also, there was a tendency for a negative relationship between adherence to taking anti-diabetic drugs/injections with chronic kidney disease prevalence in Indonesia.

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Conflict of Interests: Nil

Ethical Clearance: The study conducted using secondary data from published reports. Ethical clearance is therefore not required in the conduct of this study.

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