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Smoking History as The Main Factors of Patients Undergoing Maintenance Hemodialysis

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Abstract

Background: The high risk of death and treatment costs for chronic kidney disease make a global problem. History of hypertension, diabetes mellitus, smoking, and energy supplement drinks are factors that cause chronic kidney disease that can be controlled. Consequently, it is important to identify factors associated with poor outcomes among hemodialytic patients.
Objective: This study aims to determine the main factors associated with chronic kidney disease in a private hospital in Blitar.
Methods: The study was a cross-sectional study. 132 patients were purposively selected in the study. Data was analyzed using logistic regression.
Results: The multivariate analysis showed that a smoking history accompanied by another factor increases the risk of Chronic Kidney Disease. Diabetes Mellitus history (OR: 3.04), Hypertension history (OR: 1,4), Smoking History (OR:0,3), Drinking energy supplement history (OR:0.3) were significant variables on patients undergoing maintenance hemodialyis.
Conclusions: The foremost common cause of patients undergoing maintenance hemodialysis is smoking history. More education is needed for society to avoid chronic kidney disease by exercising health control regularly, stopping smoking, and having a healthy lifestyle.

Keywords: hypertension; diabetes mellitus; smoking; Chronic Kidney Disease

INTRODUCTION

Chronic Kidney Disease is one of the diseases that has a high risk of death and treatment costs. The Australian Institute of Health and Welfare in 2022 reported that deaths With Chronic Kidney Disease were around 17.700 or 11% of all deaths in Australia in 2020 (AIHW, 2023). The Indonesian Renal Registry (IRR) reported in 2017 that there were 77.892 chronic kidney disease patients, which increased significantly to 132.142 in 2018. East Java had the second-highest number of new patients in 2018, totaling 9.607 patients (PERNEFRI, 2018).

Kidney diseases are now recognized as a global public health priority. About 861 million individuals are affected by this disease. This non-communicable disease imposes a greater health burden in low and middle-income countries (Cockwell & Fisher, 2020). Chronic kidney disease will cause a few complications, along with anemia and cardiovascular disease (Siregar, 2020). In general, it will have an impact on the government's burden in financing because handling it requires high costs and requires high technology. It can be seen from the 2017 data from the Social Security Administering Agency for Health that chronic kidney disease costs 17.7% or 2.6 trillion rupiah in health costs, making financing ranked second after heart disease (Kemkes, 2019).

Risk factors that influence chronic kidney disease consist of constant chance elements that can not be modified, biomedical elements, and behavioral elements (AIHW, 2023c). Based on the studies of (Rahmi et al., 2021), the major elements that cause Chronic Kidney Disease consist of having a record of

diabetes mellitus and hypertension. Another study (Purwati, 2018) stated that the most dominant factors for Chronic Kidney Disease were drinking energy supplements history and smoking. Another different study stated that smoking history was the main factor contributing to Chronic Kidney Disease (Xia et al., 2017, Pranandari and Supadmi, 2017, Syamsi et al., 2021, Firmansyah, 2022).

Controlling and coping with dangerous elements can assist in reducing the danger of Chronic Kidney Disease. The developments also may be slowed with the aid of controlling and modifying the danger elements, mixed with suitable treatment and disease management (Luyckx et al., 2017).

It can be seen from several studies that the most common risk factors of Chronic Kidney Disease were having a record of hypertension, diabetes mellitus, smoking, and consumption of energy drink supplements. There are still differences of opinion regarding the factors most related to the incidence of chronic kidney disease in Indonesia, which include a record of hypertension, diabetes mellitus, smoking, and consuming energy supplements. Information regarding several factors that impact chronic kidney disease patients in Blitar has also not been investigated. In this study, we will determine the main factors that cause chronic kidney disease in Blitar, East Java, Indonesia.

The main factors that trigger Chronic Kidney Disease include having a record of diabetes mellitus and hypertension (Rahmi et al., 2021). The most dominant factors for Chronic Kidney Disease were drinking energy supplements and smoking (Purwati, 2018). Smoking history was the main factor contributing to Chronic Kidney Disease (Xia et al., 2017, Pranandari and Supadmi, 2017, Syamsi et al., 2021, Firmansyah, 2022).

Controlling and managing threat elements can assist in lessening the threat of Chronic Kidney Disease. The development may also be slowed by controlling and modifying threat elements mixed with suitable remedy and disorder management (Luyckx et al., 2017). It can be seen from several studies that the most common risk factors of Chronic Kidney Disease were having a record of hypertension, diabetes mellitus, smoking, and consumption of energy drink supplements. However, the information regarding several factors that impact chronic kidney disease patients in Blitar has still not been investigated. In this study, we will determine the main factors that cause chronic kidney disease in Blitar, East Java, Indonesia.

METHOD

Design

This study was cross-sectional study.

Population and Sample

The population of this study had changed into all hemodialytic sufferers handled in June 2023. The Sampling technique was purposive sampling. The data were then shorted based on inclusion criteria that had hemodynamic stability and no intradialytic complications, which worsened the condition. The exclusion criteria were dementia patients who have an intradialytic complication. The final number of samples that fit these criteria was 132.

Instruments

The instruments used in this study were a questionnaire containing general data of respondents, risk factors that cause chronic kidney disease, and medical laboratories consisting of serum creatinine serum and body weight.

Ethics

The Study Ethics Commission of Mardi Waluyo General Hospital approved this study by Number 800/124.8.4/410.302.3/KEP/VI/2023

Data Analysis

The data analysis was the frequency distribution for univariate analysis included sex, age, hemodialysis period, family history, a record of urinary tract disease, kidney stones, glomerulonephritis, polycystic kidney, alcohol consumed, and NSAIDs. Chi-square Test also analyzed data for bivariate analysis, including the relationship between records of hypertension, diabetes mellitus, smoking, and energy supplement drinks with chronic kidney disease. Logistic Regression Test was used for multivariate analysis.

RESULT

Characteristics of Respondents

The characteristics of respondents are presented ini the following Table 1.

Table 1. Frequency distribution of characteristic gender, age, period of hemodialysis, alcohol consumption history, NSAID consumption history (n=132)

Characteristic	Total (n)	Percentage (%)
Gender		
Male	70	53.0
Female	62	47.0
Age		
<45 years	32	24.2
45-59 years	64	48.5
≥60 years	36	27.3
HD Period		
< 5 years	92	69.7
5-10 years	31	23.5
>10 years	9	6.8
Family History		
Present	12	9.1
None	120	90.9
Urinary Tract Infection		
Present	25	18.9
None	107	81.1
History of Kidney Stones		
Present		9.1
None	12	90.9
Glomerulonephritis	120	
Present		5.3
None	7	94.7
Polycystic Kidney	125	
Present	0	0
None	132	100
Alcohol History		
Present	18	13.6
None	114	86.4
NSAID History		
Present	63	47.7
None	69	52.3

Table 1 shows the demographic of the respondents; males were 70 respondents (53%), and the frequency of respondents was primarily based totally on the age of 132 respondents who acquired the bulk results, particularlyforty-five nine years old as many as sixty-four respondents (48,5%). Table 1 also shows that the frequency distribution of respondents based on the period of hemodialysis obtained the majority of the results, namely under five years, as many as 92 respondents (69,7%). Of the family history of 132 respondents, the majorityhad no chronic kidney disease history, as many as 120 respondents (90,9%).

Table 2. Analysis of Chi-Square Test between Hypertension, Diabetes Mellitus, Smoking, and Consumption of Energy Drink History with Chronic Kidney Disease among HemodialyticSufferers

History	Chronic Kidney Disease				Total		p-value	OR
	GFR < 15		GFR ≥ 15					
	N	%	N	%	N	%		
Hypertension								
No History of Hypertension	7	5.3	20	15.2	27	20.5	0.502	1.400
History of Hypertension	21	15.9	84	63.6	105	79.5		
Diabetes Mellitus								
No History of DM	24	18.2	69	52.3	93	70.5	0.046	3.043
History of DM	4	3.0	35	26.5	39	29.5		
Smoking								
No History of Smoking	13	9.8	75	56.8	88	66.7	0.010	0.335
History of smoking	15	11.4	29	22.0	44	33.3		
Energy Suplement drink								
No History of consumption	11	8.3	65	49.2	76	57.6	0.027	3.043
History of consumption	17	12.9	39	29.5	56	424		

p value=0,502
Odds Ratio=1,400 CI= 0,523-3,748

Table 2 shows that the relationship between a history of hypertension and chronic kidney disease hasa p-value of 0.502. It indicatesthat there is not always courting among sufferers. However,sufferers who have a record of high blood pressure can experience chronic kidney disease 0.5 times greater than sufferers who no longer have a record of high blood pressure. Likewise, patients who have a history of diabetes mellitus, a history of smoking, and a history of consuming energy supplement drinks have the potential to experience chronic kidney disease at a higher rate than patients who do not have this history, namely 0.04, 0.01, and 0.027 times. Based on the result of the chi-square test, it was found that the p-value of Diabetes Mellitus history was 0.046. This situation suggests that there is a gap between diabetes mellitus records and chronic kidney disease. The p-value of smoking history was 0.01, indicating a relationship between them; likewise, for consumption of energy supplement drinks, 0.027. Based on that result, we can indicate that smoking history has the highest p-value, namely 0.01. Thus, smoking history was the most significant factor contributing to chronic kidney disease.

Through the multivariate analysis, we can see that the variables were highly related and had a significant impact on chronic kidney disease, namely hypertension history (OR=1.4), diabetes mellitus history (OR=3.0), smoking history ((OR=0.3), and consumption of energy supplement drink (OR=3.0). It means that all ofthose factors had an effect on chronic kidney disease in hemodialytic sufferers.

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DISCUSSION

Hypertension and Chronic Kidney disease

Based on the statistics in Table 2, it is recognized that almost all chronic kidney disease sufferers have a record of being affected by high blood pressure, namely 105 respondents (79.6%). The results of the bivariate evaluation in Table 2 show a p-value of 0.502, indicating no extensive courting among a record of hypertension and the prevalence of chronic kidney disease in hemodialytic sufferers. As the study subjects were patients undergoing hemodialysis several times, their kidney function might be improved, as indicated by an increase in the GFR value. The GFR value is obtained based on the patient's creatinine value. There is a significant relationship between creatinine tiers and the length of hemodialysis in chronic kidney disease patients (Ningsih et al., 2021). However, based on the odds ratio value obtained at 1.4, this means that patients with a record of hypertension have a chance or risk of developing chronic kidney disease that is 1.4 times greater than patients who do not have records of hypertension. This study showed that a record of hypertension is a risk factor for chronic kidney disease.

A long-lasting growth in blood pressure inside the arterioles and glomeruli will motivate sclerosis of the blood vessels. Sclerotic lesions that occur in small arteries, arterioles, and glomeruli will cause nephrosclerosis. This lesion occurs due to plasma leakage through the intimal membrane of blood vessels, which results in the formation of fibrinoid deposits in the media layer of blood vessels. This condition is accompanied by progressive thickening of the blood vessel walls, which makes blood vessels experience vasoconstriction and blood vessel obstruction. Obstruction occurs in the arteries and arterioles and will cause glomerular harm and tubular atrophy. It causes nephron harm, which causes chronic kidney disease(Cahyo et al., 2020).

Based on statistics in Table 2, it is recognized that almost all chronic kidney disease sufferers have a history of suffering from hypertension, namely 105 respondents (79.6%). The results of the bivariate evaluation in Table 2 display a p-value of 0.502. This means there is no significant relationship between a record of hypertension and the prevalence of chronic kidney disease in hemodialytic sufferers.

The prevalence of CKD among hypertensive sufferers at Northwest Amhara Referral Hospitals Ethiopia was 17.6%. Factors associated with this condition were dyslipidemia, proteinuria, comorbid disease, serum creatinine of more than 0.9 mg/dl, period of high blood pressure of more than 10 years, and diastolic blood pressure of more than 90 mmHg (Hunegnaw et al., 2021).

Continuous high blood pressure can cause worsening kidney features. Conversely, a modern decline in kidney features can cause worsening blood pressure control. Hypertension in chronic kidney disease happens due to decreased nephron mass, elevated sodium retention, extracellular extent expansion, sympathetic nerve activity, activation of the renin-angiotensin-aldosterone system, and endothelial dysfunction (Hunegnaw et al., 2021). The difference between the results of this study and that study is that the study subjects were patients undergoing hemodialysis several times. It can improve their kidney function, which might be improved, as indicated by an increase in the GFR value. The GFR value is obtained based on the patient's creatinine value.

There is a significant relationship between creatinine stages and the period of hemodialysis in chronic kidney disease patients (Ningsih et al., 2021). However, based on the odds ratio value obtained at 1.4, this means that patients with a record of hypertension have a chance or risk of developing chronic kidney disease that is 1.4 times more than patients who do not have a history of hypertension. This study shows that a record of high blood pressure is a risk factor for chronic kidney disease.

A long-lasting elevation in blood pressure inside the arterioles and glomeruli will cause sclerosis of the blood vessels. Sclerotic lesions that occur in small arteries, arterioles, and glomeruli will cause nephrosclerosis. This lesion occurs due to plasma leakage through the intimal membrane of blood vessels, which results in the formation of fibrinoid deposits in the media layer of blood vessels. This condition is accompanied by progressive thickening of the blood vessel walls, which makes blood vessels experience vasoconstriction and blood vessel obstruction. Obstruction occurs in the arteries, and arterioles will cause glomerular damage and tubular atrophy. It causes nephron damage, which causes chronic kidney disease (Cahyo et al., 2020). Suitable lifestyle changes are essential steps to reduce high blood pressure, namely salt restriction, excessive intake of greens and fruits, suitable weight control, every day bodily exercise, slight alcohol intake, and quitting smoking. (Kokubo, 2014, Carey et al., 2018). If this prevention management is done by individuals very well, hypertension will be controlled or can be prevented. Thus, chronic kidney disease can also automatically be prevented.

Diabetes Mellitus and Chronic Kidney Disease

Based on Table 2, it is known that chronic kidney disease sufferers had a record of being affected by Diabetes Mellitus, particularly 39 respondents (29.5%). The results of the bivariate evaluationconfirmed a p-value of 0.046, and there has been a widespread relationship between records of Diabetes Mellitus and the incidence of Chronic Kidney Disease in patients undergoing hemodialysis. The odds ratio value was 3.043, indicating that patients with a history of diabetes mellitus have a chance of experiencing chronic kidney disease three times greater than patients who do not have a history of diabetes mellitus.

A record of diabetes mellitus has a risk of developing chronic kidney disease 4.1 times more than sufferers without a record of diabetes mellitus (Adhiatma et al., 2017). Patients affectedby diabetes mellitus have a 12.37 instance hazard of experiencing chronic kidney failure (Pongsibidang, 2017).

Diabetes mellitus is a sickness characterized by hyperglycemia that takes place due to abnormalities in insulin secretion, insulin movement, or both. One of the results of diabetes mellitus complications is microvascular disease, including diabetic nephropathy, which is the main cause of end-stage kidney disease. Increased glycosylation products by non-enzymatic processes called AGEs (Advanced Glucosylation End Products), increased polyol pathway reactions, glucotoxicity, and protein kinase C contribute to kidney damage. Glomerular abnormalities are resulting protein denaturation due to excessive glucose levels, hyperglycemia, and intraglomerular hypertension. Abnormalities or changes occur in the glomerular basement membrane with the proliferation of mesangial cells. This situation will cause glomerulosclerosis and decreased blood flow, resulting in modificationswithin the permeability of the glomerular basement membrane that is characterized by albuminuria (Iwai et al., 2018).

Based on Table 2, it is known that chronic kidney disease sufferers had a record of suffering from Diabetes Mellitus, namely 39 respondents (29.5%). The outcomes of the bivariate evaluation confirmed a p-value of 0.046, indicating a significant relationship between records of Diabetes Mellitus and the incidence of Chronic Kidney Disease in patients undergoing hemodialysis. The odds ratio value becomes 3.043, indicating that patients with a record of diabetes mellitus have a danger of experiencing chronic kidney disease three times more than patients who do not have a record of diabetes mellitus.

Diabetes mellitus is the main reason for chronic kidney disease and end-stage kidney disease in the Western world (Betônico et al., 2016). A record of diabetes mellitus has a danger of developing chronic kidney disease 4.1 times more than sufferers without a record of diabetes mellitus (Adhiatma et al., 2017). Patients suffering from diabetes mellitus have a 12.37 times risk of experiencing chronic kidney failure (Pongsibidang, 2017).

Diabetes mellitus is a metabolic illness characterized by hyperglycemia that happens due to abnormalities in insulin secretion, insulin action, or both. One of the consequences of diabetes mellitus complications is microvascular disease, including diabetic nephropathy, which is the main cause of end-stage kidney disease (Shiferaw et al., 2020). Increased glycosylation products by non-enzymatic processes called AGEs (Advanced Glucosylation End Products), increased polyol pathway reactions, glucotoxicity, and protein kinase C contribute to

kidney damage. Glomerular abnormalities are caused by protein denaturation due to high glucose levels, hyperglycemia, and intraglomerular hypertension. Abnormalities or changes occur in the glomerular basement membrane with a proliferation of mesangial cells. This situation will cause glomerulosclerosis and reduced blood flow, resulting in adjustments inside the permeability of the glomerular basement membrane that is characterized by albuminuria (Iwai et al., 2018). It might be the reason for a correlation between diabetes mellitus and chronic kidney disease. An individual having uncontrolled diabetes mellitus might develop chronic kidney disease.

Other studies showed that long-term diabetes mellitus, age over 60 years, diabetic retinopathy, being female, family records of kidney disease, uncontrolled blood sugar, high systolic blood pressure, and being overweight are closely related to chronic kidney disease (Shiferaw et al., 2020). Therefore, particular preventive techniques have to be evolved to reduce the prevalence and change elements of chronic kidney disease among people living with diabetes.

Diabetes mellitus may be managed through extensive way of life intervention, specifically preserving at the very least 7% weight reduction and 150 minutes of bodily activity per week that is equal to depth to brisk walking (Committee, 2022).

Smoking Records and Chronic Kidney Disease

Based on Table 2, it shows that 44 respondents (43.3%) have a history of smoking. The results of the bivariate evaluation showed a p-value of 0.010, indicating a significant relationship betweensmoking records and the prevalence of chronic kidney disease in patients undergoing . Based on the odds ratio obtained, it is 0.335, indicating that sufferers with a record of smoking have a chance or risk of developing chronic kidney disease 0.335 instances more than sufferers who do not have a record of smoking.

There is a relationship between smoking records and the prevalence of chronic kidney failure in patients undergoing hemodialysis. CKD patients on hemodialysis who have a record of smoking have a threat of CKD events that is two instances more than sufferers without a record of smoking (Pranandari and Supadmi, 2017). It can be concluded that a record of smoking is a threat element for chronic kidney disease.

The components of cigarette smoke inhaled by smokers consist of the gas part (85%) in the form of carbon monoxide (CO), ammonia, and nitrogen oxide, and the particulate part (15%) in the form of tar and nicotine. Cigarettes contain approximately 4000 types of chemicals that are carcinogenic and dangerous to health. Smoking stimulates an increase in blood pressure and heart rate through sympathetic activation and vasopressin release. Activation of the sympathetic system will increase circulating catecholamine levels, stimulate renin production through β1 receptors, and then stimulate AII. Angiotensin II causes tubular and glomerular damage through the mechanisms of pressure-precipitated renal damage and ischemia-induced renal damage. This circumstance is a secondary outcome of intrarenal vasoconstriction and reduced renal blood flow. In addition, tubular damage occurs secondary to angiotensin-induced proteinuria(Setyawan, 2021).

In another study, patients experienced CKD, but most did not have a history of smoking. According to Eid et al. 2022, the occurrence of impaired renal function is influenced by age, passive or active smoking, and the concentration of nicotine in cigarettes (Eid et al., 2022). Besides smoking, age is suspected to affect kidney disease. De Nicola L. et al. 2015 study stated that 32.9% of sufferers were < 65 years of age and suffered from a huge spectrum of renal diagnoses (inclusive of glomerulonephritis, polycystic kidney disorder, and diabetic nephropathy). Independent function of underlying kidney disease on the renal prognosis of sufferers with chronic kidney disease under nephrology care (De Nicola et al., 2015).

There is a relationship between smoking records and the prevalence of chronic kidney failure in patients undergoing hemodialysis. CKD sufferers on hemodialysis who have a record of smoking have a chance of CKD events, that is two instances more than sufferers without a record of smoking (Pranandari and Supadmi, 2017). It can be concluded that a record of smoking is a chance for

chronic kidney disease. Exposure to cigarette smoke in passive or active smokers has the same effect on the prevalence of chronic kidney disease.

The components of cigarette smoke inhaled by smokers consist of the gas part (85%) in the form of carbon monoxide (CO), ammonia, and nitrogen oxide, and the particulate part (15%) in the form of tar and nicotine. Cigarettes contain approximately 4000 types of chemicals that are carcinogenic and dangerous to health. Smoking stimulates an increase in blood pressure and heart rate through sympathetic activation and vasopressin release. Activation of the sympathetic system will increase circulating catecholamine levels, stimulate renin production through β1 receptors, and then stimulate AII. Angiotensin II causes tubular and glomerular harm through the mechanisms of pressure-induced renal damage and ischemia-induced renal damage. This condition is a secondary consequence of intrarenal vasoconstriction and decreased renal blood flow. In addition, tubular damage occurs secondary to angiotensin-induced proteinuria (Setyawan, 2021).

The effect of smoking in the acute phase is increasing sympathetic stimulation, which will extend blood pressure, tachycardia, and accumulation of catecholamines inside the circulation. In the acute phase, a few blood vessels additionally frequently experience vasoconstriction, for instance,within the coronary blood vessels, so that during acute people who smoke, that is frequently observed often followed by an increase in renal vascular resistance ensuing in a lower in glomerular filtration rate and filter fraction (Lee et al., 2021).
Smoking habits are associated with cardiovascular events and mortality. It further strengthens the relationship between smoking risk factors and kidney disorders (Provenzano et al., 2021). The number of cigarettes and the duration of smoking influence the magnitude of the chance of chronic kidney disease that a person will suffer. The more cigarettes are consumed, the longer the time smoking will increase the risk of four to ten times the risk of suffering from it (Aisyah et al., 2015). The data in this study showed that not all respondents have a history of smoking. Respondents who had a history of smoking have other risk factors for causing kidney disease. These factors are age, family hereditary factors, history of urinary tract infections, urinary tract stones, glomerulonephritis, hypertension, history of diabetes mellitus, history of consuming energy supplement drinks, history of alcohol consumption, and history of consuming NSAIDs. Thus, the risk factor of smoking is not the only factor in causing chronic kidney disease. Smoking behavior, together with other risk factors, increases the chance of chronic kidney disease.

Smoking has a considerable courting to the prevalence of chronic kidney disease. The study was performed on the hemodialysis unit of Dr. Hospital. Moerwadi confirmed that there has beenconsiderable courting among them(Purwati, 2018). Smoking is also related to kidney characteristic profiles. Patients undergoing hemodialysis who have a record of smoking have a threat two times more than sufferers without a record of smoking with chronic kidney disease (Syamsi et al., 2021, Pranandari and Supadmi, 2017). The courting between smoking and kidney disease is related to hemodynamic and non-hemodynamic mechanisms. The hemodynamic mechanism entails activation of the sympathetic nervous system with manifestations of elevated blood pressure and heart rate. Meanwhile, non-hemodynamic mechanisms are related to the toxic effects of smoking on the endothelium, which causes endothelial cell dysfunction and tubulotoxic effects, in addition to proliferation and matrix accumulation of vascular smooth muscle cells, endothelial cells, and mesangial cells(Setyawan, 2021). Smoking also causes other health problems. Diabetes mellitus patients experience with erectile dysfunction mostly have a smoking history (Primanda et al., 2023).

Consumption of Energy Supplement Drink Records and Chronic Kidney Disease

Based on Table 2, it is known that among chronic kidney disease sufferers who consumed energy drink supplements were 76 respondents (42.4%). The results of the bivariate evaluation confirmed a p-value of 0.027, indicating there has been a significant courting among the records of consuming energy drink supplements and the prevalence of chronic kidney disease in patients undergoing hemodialysis. Based on the odds ratio, namely 0.388, patients with a record of consuming energy drink supplements have a danger of experiencing chronic kidney disease that is 0.388 times more than sufferers who no longer have a record of consuming energy drink supplements.

A history of consuming energy supplement drinks has a statistically significant relationship with the prevalence of CKD stage 5 with a p-value of 0.008 and an OR value of 0.074, indicating that patients who consume energy supplement drinks are 0.074 times more likely to suffer from chronic kidney disease than patients who do no longer have a record of consuming energy supplement(Purwati, 2018). Another study stated that A history of consuming energy supplement drinks has a statistically significant courting among the incidence of chronic kidney disease stage 5 with a p-value of 0.008 and an OR value of 0.074, indicating that patients who consume energy supplement drinks are 0.074 times more likely to suffer from chronic kidney disease than patients who do not have a history of consuming energy supplements (Rohma,2022). Energy drink consumption has rarely been reported as a cause of acute kidney injury. This study reported that this is the first to show the negative impact of energy drinks on the kidneys without the combination of alcohol. However, the exact mechanism of injury is not known yet(Greene et al., 2014).

Energy supplements are a type of drink that contains large amounts of stimulants such as caffeine, the amino acid taurine, added sugar or sweeteners, and additives. This drink is usually consumed to increase energy, stamina, physical performance, concentration, and mood, as well as to overcome fatigue. The thing that makes energy drink supplements dangerous is the taurine content in these drinks. Taurine also plays a role in damaging the kidney organs. Taurine is a detoxifying amino acid that has a glycine-like impact in neutralizing all varieties of toxins. Consuming much of taurine in dietary supplements in quantities that exceed the edge of 40-400 mg/day makes the kidneys work tougher and might place you at risk of suffering from kidney failure. If eaten up over a protracted period, those materials can slender the arteries to the kidneys, so much less blood goes to the kidneys(Fandra et al., 2019).

Study conducted on rats showed the negative impact of combining energy drinks with alcohol. Thus, it was concluded in this study that drinking energy drinks combined with alcohol is not safe for consumers (Costa-Valle et al., 2018). Therefore, preventive measures must be disseminated among at-risk populations such as adolescents. In one case report, there were reports of acute kidney injury and acute hepatitis induced by energy drinks. However, the level of toxicity of this drink to the kidneys and liver is not explained (Yacoub et al., 2020). It is better to avoid excessive use of energy drinks until further study is found regarding the safe limits for consuming these drinks.

Based on the study statistics, it appears that the majority of chronic kidney disease patients undergoing hemodialysis no longer have a previous record of kidney disorders such as urinary tract infections, kidney stones, glomerulonephritis, and polycystic kidneys. Thus, it can be concluded that other factors, such as a record of hypertension, diabetes mellitus, smoking, and drinking energy drinks, have a greater chance of chronic kidney disease.

The limitation of the study is the respondents. They were chronic kidney disease patients who had been long experiencing hemodialysis, which affected GFR. In reality, in this study, the GFR value is utilized to decide the degree of unremitting kidney illness. By controlling or preventing all of these factors, chronic kidney disease can be prevented.

CONCLUSION

Based on the study, variables relatedto chronic kidney disease were records of diabetes mellitus, smoking, and consuming energy drinks. Meanwhile, the factor that was most strongly related to these components was smoking records. Individuals who smoked had a 0.3 times greater risk of developing chronic kidney disease than people who did not smoke. The impact of smoking within the intense stagewas increasing sympathetic stimulation, which was ableto result in expanded blood pressure, tachycardia, and aggregation of catecholamines within the circulation. In this stage, a few blood vessels also experienced vasoconstriction, for case, within the coronary blood vessels, so that in acute smoking, it was regularly accompanied by an increase in renal vascular resistance. This condition would cause a diminish in the glomerular filtration rate and filter fraction.

Based on the study, factors associated with chronic kidney disease were a record of diabetes mellitus, smoking, and consuming energy drinks. Meanwhile, the factor that was most strongly related to these factors was smoking records. Individuals who smoke have a 0.3 times more noteworthy hazard of creating chronic kidney illness than individuals who did not smoke. The effect of smoking within the intense stagewas increasing sympathetic stimulation, which can result in expanded blood pressure, tachycardia, and aggregation of catecholamines within the circulation. In this stage, a few blood vessels, moreover, encounter vasoconstriction, such as in the coronary blood vessels. Thus, in intense smoking it is frequently accompaniedby an increment in renal vascular resistance. This condition would cause a diminishing glomerular filtration rate and channel division. It is recommended that future study use subjects from patients who have just been diagnosed with chronic kidney disease.

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