Kidney Disease with Metabolic Syndrome Risk Factor Using Dynamic Model Approach in Indonesia

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ABSTRACT

The aim of this study to estimate occurrence of chronic kidney disease with metabolic syndrome disease in the next 22 years and to find out the most appropriate strategy to press increase of the occurrence of chronic kidney disease in Indonesia. The study was a cross sectional research used Basic Health Research of Indonesia data in 2013. The samples were respondents aged from 25 years old and above. The data were variables of number of chronic kidney disease patients, obesity prevalence, diabetes mellitus (OM), hypertension, dyslipidemia, sweet, salty, and fatty food or drink consumption, fiber consumption, physical activities, and smoking habit. The data were analyzed using dynamic system Powersim program. The dynamic model was started by developed Causal loop and Flowchart Diagram model of chronic kidney disease occurrence. The number of chronic kidney disease incidents in the population ≥25 years old for 22 years (2013-2035) in Indonesia was estimated 2116 persons (6.07) with multiple of 20.15 times. The chronic kidney disease incidents decreased in the population aged ≥25 years old for 22 years (2013-2035) in Indonesia if metabolic syndrome influenced chronic kidney disease had controlled on simulation model VII, which controlled on obesity and hypertension prevalence about 730 persons. Most suitable strategy on reducing chronic kidney disease incidents was on simulation model VII by reduced obesity 8.3% and hypertension 15.8% which suppressed the increment rate of chronic kidney disease patients by 13.2 times from initial condition without control.

CCS Concepts

•Social and professional topics → User characteristics

Keywords

Estimation; dynamic model; chronic kidney disease; metabolic syndrome

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1. INTRODUCTION

National Health Insurance system introduced by Indonesia Ministry Health had increased number of visitors to health center. The advantage of this health insurance helped poor since most of health service was high in expenses [1]. In Indonesia, there are 889, 356 people had suffered chronic kidney disease. The chronic kidney disease needed more financial and moral support for patients and their families especially in developing countries [2].

The number of new chronic kidney disease patients has increased each year from 4, 977 in 2007 and reached 19,621 in 2012 or increased 3.94 times in 5 years. The active patients also increased from 1885 in 2007 to 9,161 in 2012 [3]. The chronic kidney disease patients undergone dialysis had increased sharply from 5,700 patients to 35, 000 patients at Syaiful Anwar Malang Hospital [4]. The albuminuria prevalence and decreased glomerular filtration rate is increased from 1988-1994. The chronic kidney disease increased is due to diabetes and hypertension [5]. The initial factor of chronic kidney disease such as age, family history background, ethnicity, gender, diabetes mellitus, metabolic syndrome, hyper filtration status (blood pressure>125/75 mm/Hg, obesity, high protein diet, anemia), dyslipidemia, nephrotoxin, primary kidney disease, urological disorders and cardiovascular disease [6]. The metabolic syndrome components such as obesity, hypertension, triglycerides and decreased in high density lipoprotein (HDL) were found in chronic kidney disease patients with diabetes mellitus type 2 [7]. The Basic Health Research Survey on 2013 showed high number indictors was in metabolic syndrome component. The prevalence of obesity was 19.7%, central obesity was 26.6%, diabetes mellitus was 2.1%, hypertension was 9.5% [8].

This study was conducted to analyze chronic kidney disease incidence with risk factor of metabolic syndrome component. The high prevalence in metabolic syndrome and chronic kidney disease indicated tendency of increased in disease with life patterns with risk factor in every year. The metabolic syndrome and chronic kidney disease had impact on human resource quality and increased health service cost. Thus, a dynamic modeling approach was needed to estimate chronic kidney disease patients in Indonesia, in order to obtain appropriate risk factor control strategies to reduce the chronic kidney disease rate.

2. METHODOLOGY

2.1 Study Type

The study was secondary data analysis with dynamic system modeling simulation. The cross-sectional research used Basic Health Research of Indonesia data in 2013.The samples were respondents aged from 25 years old and above. The data were

variables of number of chronic kidney disease patients, obesity prevalence, diabetes mellitus (OM), hypertension, dyslipidemia, sweet, salty, and fatty food or drink consumption, fiber consumption, physical activities, and smoking habit. The data were analyzed using dynamic system Powersim program. The dynamic model was started by developed Causal loop and Flowchart Diagram model of chronic kidney disease occurrence.

2.2 Location and Time

The study was conducted using secondary data of Indonesia Basic Health Research (Riskesdas). Indonesia was selected based on high prevalence in chronic renal failure and metabolic syndrome. The analysis implementation of Riskesdas 2013 data that associated with metabolic syndrome as a predictor of chronic renal failure began in November 2015.

2.3 Population and Sample

The population was Riskesdas 2013 data. The study samples were all data related to study variables such as chronic kidney function, obesity factors: fiber consumption, metabolic syndrome with obesity and sweet food consumption patterns, dyslipidemia with risk factors included obesity and fatty food consumption and hypertension with risk factors included obesity, diabetes mellitus, smoking habit and salty food consumption.

3 RESULT AND DISCUSSION

3.1 Bivariate Analysis

This study used Riskesdas in year 2013 data involved 38, 399 respondents. There were 29, 956 respondents met criteria for this study. The inclusion criteria included respondent must be age more than 25 years old since normal distribution of chronic kidney disease patients in Indonesia starting from 25 years to 29 years old. The data was analyzed by using SPSS program to determine the relationship of variables.

Table 1. Relationship of significant variables of risk factor toward metabolic syndrome occurrence.

No	Metabolic syndrome components	Risk factor	p value
1.	General obesity	Vegetable consumption Fruit consumption Fiber consumption	0.000 0.000 0.000
2.	Diabetes Mellitus	Physical activity Sweet food consumption	0.164 0.000
3.	Hypertension	Salty food consumption	0.004
4	Dyslipidemia		
	*HDL *LDL *Total cholesterol *triglycerides	Fatty food Fatty food Fatty food Fatty food	0.000 0.274 0.904 0.002

Source: Primary Data

Table 2. Relationship of significant variables of metabolic syndrome toward chronic kidney disease.

No	Metabolic syndrome components	Risk factor	p value
1.	General obesity	Body Mass Index (BMI) Waist circumference	0.065 0.245
2.	Diabetes Mellitus	Diagnosis Biomedical	0.000* 0.032*
3.	Hypertension	Blood pressure	0.001*
4	Dyslipidemia	Total cholesterol HDL LDL triglyceride	0.670 0.012* 0.827 0.181

Source: Primary data

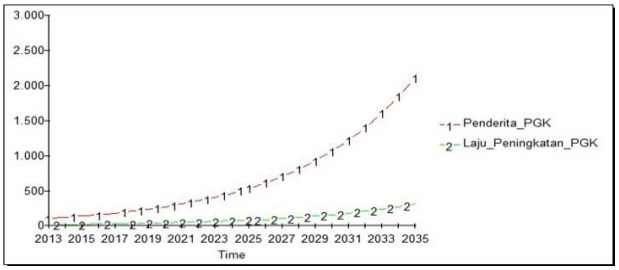
Table 3. Relationship of significant variables of risk factor of metabolic syndrome components toward chronic kidney disease.

No	Metabolic syndrome components	Risk factor	p value
1.	General obesity	Vegetables consumption Fruit consumption Fiber consumption Physical activity	0.694 0.074 0.001* 0.887
2.	Diabetes Mellitus	Sweet food consumption Salty food consumption	0.001* 0.271
3.	Hypertension	Smoking status	0.042*
4	Dyslipidemia	Fatty food consumption	0.315

Source: Primary Data

Further study had been done to obtain mean and occurrence values for the simulation. These variables included fiber (fruit and vegetables), physical activity, obesity, sweet food and drink consumption patterns, diabetes mellitus patients, fatty food consumption patterns, dyslipidemia patients, chronic kidney disease patient and non-patient. The simulation duration is planned to 22 years according to projected population data of Central Bureau of Statistic which is available until 2035.

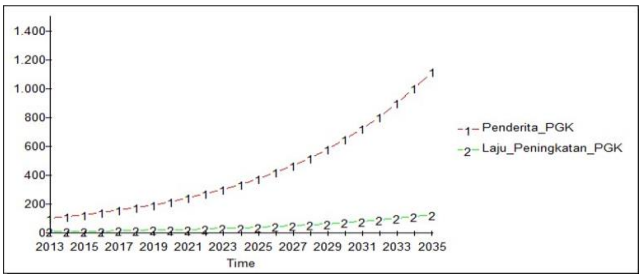
The estimation about number of chronic kidney disease patients and non-chronic kidney disease patient for 22 years (2013-2035) was based on several simulation models.



Graph 1. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (I).

The chronic kidney disease incidence increased by 20.15 times from 105 respondents (0.35%) in 2013 to 2116(6.07%) in 2035 with average increase in chronic kidney disease incidence by 0.92 times per year without control of chronic kidney disease risk factors. The number of non-chronic kidney disease patients based on first model has increased by 1.10 times from 29, 851 respondents (99.65%) in 2013 to 32, 757 respondents (93.93%) in 2035 with an average increase of 0.05 times per year.

The simulation model II had controlled one component of metabolic syndrome (obesity) by decreased obesity prevalence from 38.1% to 29.8% in chronic kidney disease patients while constant value/value/another variable was remained. The decrements of obesity prevalence by 8.3% with consideration that prevalence of obesity in non-chronic kidney disease patients population was 29.8% so that the author equalized prevalence of obesity in patients with and without chronic kidney disease.

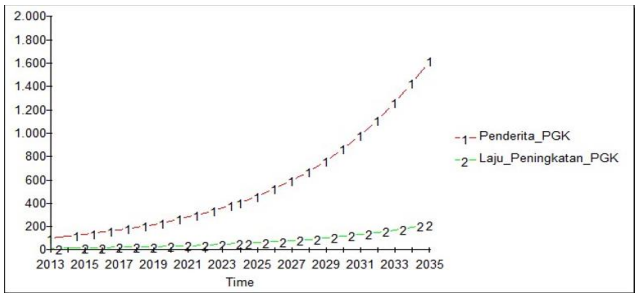


Graph 2. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (II).

Based on Graph 2, the chronic kidney disease incidence increased by 10.69 times from 105 (0.35%) in 2013 increased to 1,122 people (3.31%) in 2035 with an average increase in chronic kidney disease incidence by 0.49 times per year. The number of patients without chronic kidney disease based on simulation II is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (96.69%) in 2035, average increase of 0.15 times per year.

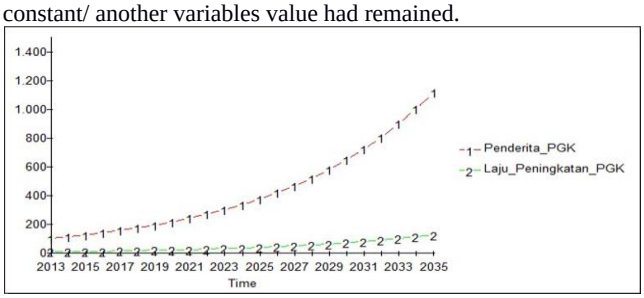
The simulation model (III) was controlled to variable of component of metabolic syndrome (diabetes mellitus) by decreased percentage of diabetes mellitus by 6.7% from 18.1% to 11.4% in chronic kidney disease patients group and other variable value remained.

The chronic kidney disease incidence increased by 15.47 times from 105 (0.35%) in 2013 increased to 1,625 people (4.73%) in 2035 with an average increase in chronic kidney disease incidence by 0.70 times per year. The number of patients without chronic kidney disease based on simulation III is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (95.27%) in 2035, average increase of 0.05 times per year.



Graph 3. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (III).

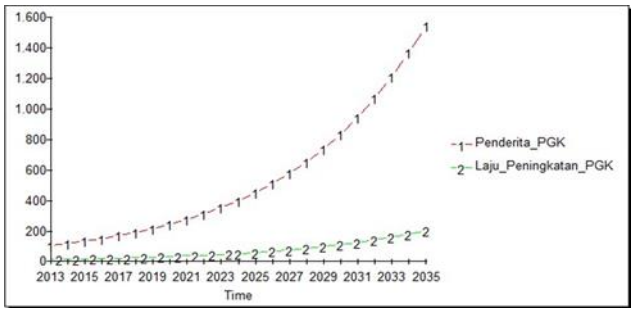
The simulation model (IV) was controlled to metabolic syndrome component (hypertension), that decrements percentage pf hypertension patients were 15.8% from 67.6% to 51.8%, while constant/ another variables value had remained.



Graph 4. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (IV).

The chronic kidney disease incidence increased by 11.83 times from 105 (0.35%) in 2013 increased to 1,242 people (3.65%) in 2035 with an average increase in chronic kidney disease incidence by 0.54 times per year. The number of patients without chronic kidney disease based on simulation IV is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (96.35%) in 2035, average increase of 0.05 times per year.

The simulation model (V) was controlled to metabolic syndrome component (dyslipidemia), that decrement percentage pf hypertension patients were 10% from 33% to 23%.

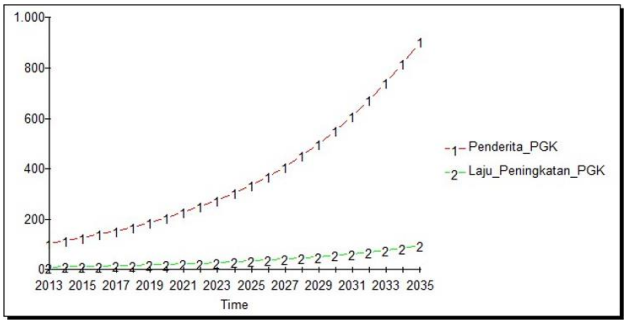


Graph 5. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (V).

The chronic kidney disease incidence increased by 14.77 times from 105 (0.35%) in 2013 increased to 1,551 people (4.52%) in

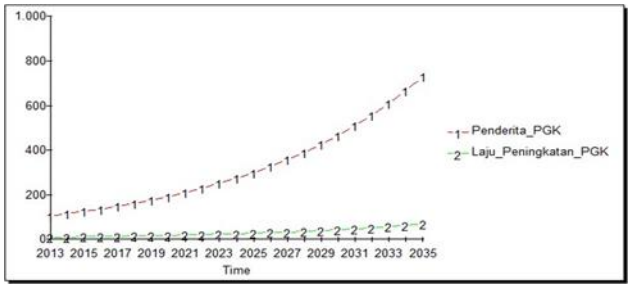
2035 with an average increase in chronic kidney disease incidence by 0.67 times per year. The number of patients without chronic kidney disease based on simulation II is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (95.48%) in 2035, average increase of 0.05 times per year.

The simulation model VI was done by combination of two metabolic syndrome components included obesity and diabetes mellitus prevalence. The prevalence of obesity and diabetes mellitus in chronic kidney disease patients that same to prevalence in non-chronic kidney disease patients. The prevalence of obesity from 38.1% to 29.8% and diabetes mellitus from 18.1% to 11.4%.



Graph 6. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (VI).

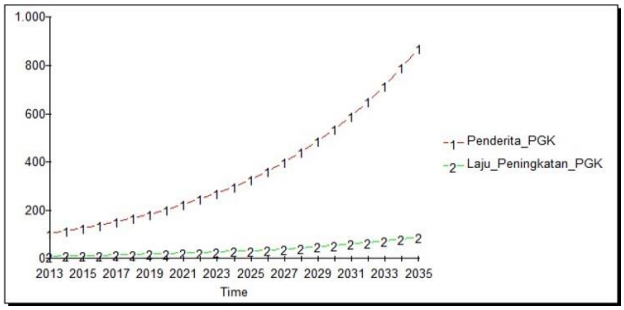
Based on Graph 6, the chronic kidney disease incidence increased by 8.63 times from 105 (0.35%) in 2013 increased to 907 people (2.69%) in 2035 with an average increase in chronic kidney disease incidence by 0.99 times per year. The number of patients without chronic kidney disease based on simulation VI is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.31%) in 2035, average increase of 0.05 times per year.The simulation model VII was done by combination control of 2 metabolic syndrome components of obesity and hypertension prevalence. The prevalence of chronic kidney disease patients incidence was same as non chronic kidney disease patients. The prevalence of obesity from 38.1% to 29.8% and hypertension from 67.6% to 51.8%.



Graph 7. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (VI).

Based on Graph 7, the chronic kidney disease incidence increased by 8.63 times from 105 (0.35%) in 2013 increased to 907 people (2.69%) in 2035 with an average increase in chronic kidney disease incidence by 0.99 times per year. The number of patients without chronic kidney disease based on simulation VII is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.31%) in 2035, average increase of 0.05 times per year.

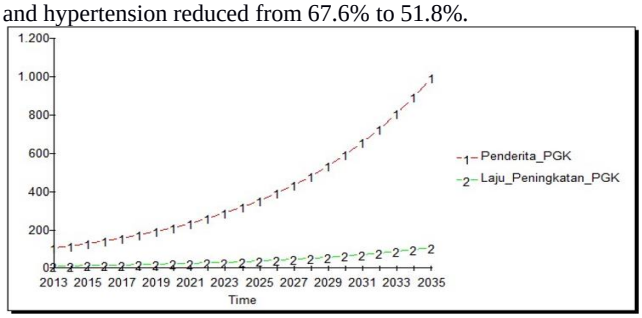
The simulation model VIII was done by combination of controlling two metabolic syndromes (obesity and dyslipidemia). The prevalence of obesity and in chronic kidney patients was reduced as same as prevalence in non-chronic kidney disease patients. The prevalence reduced from 38.1% to 29.8% and dyslipidemia reduced from 33.0% to 23%.



Graph 8. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (VIII).

The chronic kidney disease incidence increased by 8.32 times from 105 (0.35%) in 2013 increased to 873 people (2.60%) in 2035 with an average increase in chronic kidney disease incidence by 0.38 times per year. The number of patients without chronic kidney disease based on simulation VIII is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.40%) in 2035, average increase of 0.15 times per year.

The simulation model IX was done by combination of controlling 2 metabolic syndrome components, prevalence of diabetes and hypertension by equalizing each prevalence of chronic kidney disease patient incident with non chronic kidney disease patients. The prevalence of diabetes mellitus reduced from 18.1% to 11.4% and hypertension reduced from 67.6% to 51.8%.

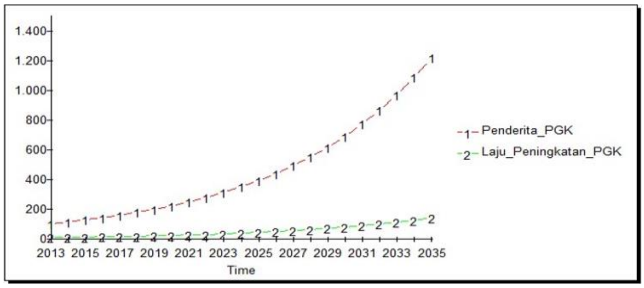


Graph 9. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (IX).

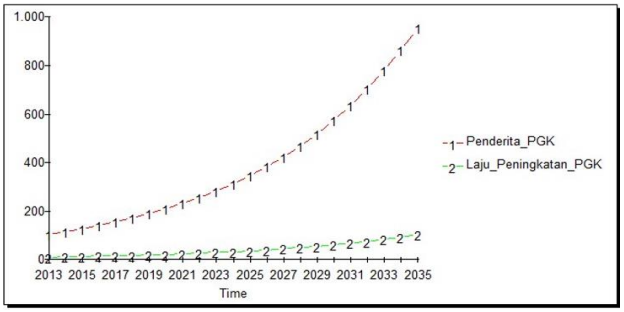
The chronic kidney disease incidence increased by 9.48 times from 105 (0.35%) in 2013 increased to 995 people (2.95%) in 2035 with an average increase in chronic kidney disease incidence by 0.43 times per year. The number of patients without chronic kidney disease based on simulation VIII is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.05%) in 2035, average increase of 0.05 times per year.

The simulation model X was done by combination of controlling prevalence of diabetes mellitus and dyslipidemia by equalizing prevalence of chronic kidney disease patients with non-chronic kidney disease patients. The prevalence of diabetes mellitus decreased from 18.1% to 11.4% and prevalence of dyslipidemia reduced from 33.0% to 23.0%.

Based on Graph 10, the chronic kidney disease incidence increased by 11.63 times from 105 (0.35%) in 2013 increased to 1,221 people (3.59%) in 2035 with an average increase in chronic kidney disease incidence by 0.53 times per year. The number of patients without chronic kidney disease based on simulation X is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.41%) in 2035, average increase of 0.05 times per year.



Graph 10. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (X).



Graph 11. Estimation of chronic kidney disease incidents for 22 years (2013 to 2035) in Indonesia based on the simulation model (XI).

The chronic kidney disease incidence increased by 9.12 times from 105 (0.35%) in 2013 increased to 957 people (2.95%) in 2035 with an average increase in chronic kidney disease incidence by 0.41 times per year. The number of patients without chronic kidney disease based on simulation XI is the same as simulation I, which increased by 1.10 times from 29,851 people (99.65%) in 2013 to 32,757 people (97.16%) in 2035, average increase of 0.05 times per year.

Table 4. Comparison of number chronic kidney disease patients of simulation model I- XI with population projection ≥ 25 years old from 2013-2035.

Simulation model	Estimation of non-chronic kidney disease (projection) population	Population projection 25+ years	Total chronic kidney disease & non chronic kidney disease (Riskesdas)
Simulation 1	135, 922, 198	136, 400, 300	29, 956
	155, 037, 366	165, 052, 296	34, 873
Simulation 2	135, 922, 198	136, 400, 300	29, 956
	159, 586, 117	165, 052, 296	33, 879
Simulation 3	135, 922, 198	136, 400, 300	29, 956
	157, 253, 333	165, 052, 296	34, 382
Simulation 4	135, 922, 198	136, 400, 300	29, 956
	159, 023,884	165, 052, 296	33, 999
Simulation 5	135, 922, 198	136, 400, 300	29, 956
	157, 589, 123	165, 052, 296	34, 308
Simulation 6	135, 922, 198	136, 400, 300	29, 956
	160, 607, 627	165, 052, 296	33, 664
Simulation 7	135, 922, 198	136, 400, 300	29, 956
	161, 453, 900	165, 052, 296	33, 487
Simulation 8	135, 922, 198	136, 400, 300	29, 956
	160, 765, 749	165, 052, 296	33, 630
Simulation 9	135, 922, 198	136, 400, 300	29, 956
	160, 186, 978	165, 052,296	33, 752
Simulation 10	135, 922, 198	136, 400, 300	29, 956
	159, 121, 982	165, 052, 296	33, 978
Simulation 11	135, 922, 198	136, 400, 300	29, 956
	160, 366, 198	165,052, 296	33, 714

Source: Secondary data processed, 2012

Table 5. Comparison of number chronic kidney disease patients of simulation model I- XI with population projection ≥ 25 years old from 2013-2035.

Simulation model	Estimation of non-chronic kidney disease (projection) population	Population projection 25+ years	Total chronic kidney disease & non-chronic kidney disease (Riskesdas)
Simulation 1	135, 922, 198	136, 400, 300	29, 956
	155, 037, 366	165, 052, 296	34, 873
Simulation 2	135, 922, 198	136, 400, 300	29, 956
	159, 586, 117	165, 052, 296	33, 879
Simulation 3	135, 922, 198	136, 400, 300	29, 956
	157, 253, 333	165, 052, 296	34, 382
Simulation 4	135, 922, 198	136, 400, 300	29, 956
	159, 023,884	165, 052, 296	33, 999

Simulation 5	135, 922, 198	136, 400, 300	29, 956
	157, 589, 123	165, 052, 296	34, 308
Simulation 6	135, 922, 198	136, 400, 300	29, 956
	160, 607, 627	165, 052, 296	33, 664
Simulation 7	135, 922, 198	136, 400, 300	29, 956
	161, 453, 900	165, 052, 296	33, 487
Simulation 8	135, 922, 198	136, 400, 300	29, 956
	160, 765, 749	165, 052, 296	33, 630
Simulation 9	135, 922, 198	136, 400, 300	29, 956
	160, 186, 978	165, 052,296	33, 752
Simulation 10	135, 922, 198	136, 400, 300	29, 956
	159, 121, 982	165, 052, 296	33, 978
Simulation 11	135, 922, 198	136, 400, 300	29, 956
	160, 366, 198	165,052, 296	33, 714

Source: Secondary data processed, 2012

The chronic kidney disease patients in 2013 was 478, 102 people based on projected population data in Indonesia and increased to 10, 014, 930 people in 2035.The simulation by controlling metabolic syndrome component factors that affected chronic kidney disease separately and simultaneously. The simulation model VII showed highest number in chronic kidney disease decrement in next 22 years that 3,598,396 people. The simulation model VII is a simulation with control of prevalence of obesity and hypertension. The highest different in chronic kidney disease was showed in simulation model VIII (combination of metabolic syndrome: obesity and dyslipidemia) of 4,286,547 people. Meanwhile, the simulation model showed lowest different with diabetes mellitus prevalence control was 7,798,963 people.

The chronic kidney disease is found among risk factor due to metabolic syndrome such as obesity (Central obesity), diabetes mellitus, hypertension and dyslipidemia. The 3 components of metabolic syndrome such as hypertension, diabetes mellitus and dyslipidemia (HDL examination indicator) showed significant relationship with chronic kidney disease. The person without risk factor of chronic kidney disease had suffered this disease by 10% for 6 years [2]. The declined in β cell function started from 4 years until 7 years before diagnosed metabolic syndrome [9]. The factors affected chronic kidney disease in this study were related to accommodation of presence of one or more risk factors in metabolic syndrome components. The metabolic syndrome components contained variables such as obesity with physical activity and fiber consumption. The metabolic syndrome with risk in sweet consumption, hypertension with risk of smoking status and salty food consumption, and dyslipidemia with risk factor for fatty food consumption. The smoking status and fiber consumption had significant relationship with increased chronic kidney disease.

The simulation model was estimated for 11 times: simulation model 1 (one time without control), model II- VI (4 times with control of each prevalence of metabolic syndrome components), simulation model VI- X (6 times with control combination with 2 metabolic syndrome components). The simulation model combination was only combined for 2 metabolic syndrome components.

This study was showed number of chronic kidney disease increased on the population ≥25 years old in Indonesia 20.15 times from 105 people (0.35%) on 2013 to 2,116 people (6.07%) on 2035 which the increment on 0.92 times every year without control toward variables/ factors that influenced chronic kidney disease.

Indonesian Nephrology Association (PERFINEFRI) annually data for 5 years was compared with the first 5 years estimation. The data was showed on Table 6.

Table 6. Annual improvement of chronic kidney disease of PERFINEFRI report.

No	Years	Active chronic kidney disease patient	The increment from previous year
1.	2007	1885	-
2.	2008	1936	1.03 times
3.	2009	4707	2.43 times
4.	2010	5184	1.10 times
5.	2011	6951	1.34 times
6.	2012	9191	1.32 times
Total	7.22 times		
Average improvement	1.44 times		

Source: Secondary data processed, 2012

Table 7. Annual improvement of chronic kidney disease estimation.

No	Years	Active chronic kidney disease patient	The increment from previous year
1.	2013	105	-
2.	2014	121	1.15 times
3.	2015	138	1.14 times
4.	2016	158	1.15 times
5.	2017	181	1.15 times
6.	2018	207	1.14 times
Total	5.73 times		
Average	1.15 times		

improvement	

Source: Secondary data processed, 2012

There was increment of 1.44 times on chronic kidney disease was based on PERFINEFRI's 5 annual report. Meanwhile, estimation increase of 1.15 times and difference was 0.29 or 29%. The difference between the model and real data about 5% and 29% indicated that there was still lack of variables that affected chronic kidney disease. The estimation value much smaller than the actual value. The number of chronic kidney disease based on estimation with population on 2035 was 10, 014, 930 people.

The number of chronic kidney disease patients was reduced found in the 7th simulation model with the control of one indicator of metabolic syndrome, that was obesity and hypertension prevalence with 13.2 times for 22 years compared without control. The obesity was the beginning of metabolic syndrome. The preliminary research had proved that obesity as the risk factor for chronic kidney disease. In Japan, the individual with BMI>25 kg/m^2 and found development of chronic kidney disease was highly significant in individuals with metabolic syndrome after 5 years [10]. The glomerular hyperfiltration is major mechanism of pathogenesis of glomerulopathy was related with obesity. The glomerular hyperfiltration was converted became albuminuria and lead to kidney failure with histopathologic characteristics such as glomerulomegaly and focal glomerulosclerosis [2].

There was no significant relationship between obesity and BMI indicator used in this simulation. The obesity had affected by the fiber consumption habit. The fiber consumption had significant different between chronic kidney disease group and non-chronic kidney disease group.

In additions, obesity is among indicator in metabolic syndrome and developed into diabetes mellitus, hypertension and dyslipidemia to chronic kidney disease. Based on IDF 2005, obesity on metabolic syndrome was used the central obesity or waist as indicator. In this study, the obesity was used body mass index (BMI) as the indicator. The kidney failure was observed on the dog with high doses of fat intake on 7 to 9 weeks and included glomerular enlargement with Bowman capsule expansion, glomerular cell proliferation, mesangial expansion matrix and glomerular thickening and basal tubular membrane [11]. The weight loss significantly decreased proteinuria, albuminuria, blood pressure, lipid profile, blood sugar level and insulin level [12]. In obesity patients with glomerular hyperfiltration, surgical interventions to lose the weight for normalized the glomerular hyperfiltration and lower blood pressure as well s microalbuminuria [13]. The patients with type 2 diabetes mellitus showed daily fiber intake was related with abdominal obesity prevalence, low hypertension of albuminuria prevalence, low glomerular hyperfiltration estimation and kidney failure incidents [14]. The high fiber intake is also related with low interleukin-6 level and tumor necrosis-alpha receptor-2 in post-menopausal women. The important of role that high fiber in the diet to decrease systemic inflammation [15]. The effect of alkali from fiber intake helped in maintained acidity level and reduced the metabolic acidosis risk related with kidney function [16]. The recommendation in fruit and vegetables consumption accorded to World Health Organization (WHO) was 400 grams per day as much as 3-5 servings a day. In additions, food guide pyramid had recommended 3-4 times serving a day [17].

The number of chronic kidney disease is reduced by simulation model VII on control with one indicator of metabolic syndrome such as hypertension. The hypertension was among the risk factor on the chronic kidney disease. The relationship between hypertension and kidney had been known since Richard Bright in 1836. The kidney disease caused increased the blood pressure and hypertension in long term caused kidney disorders. The hypertension affected on kidney depend on high blood pressure and hypertension duration. The high blood pressure and long term of hypertension duration had more suffered complications [2]. The number of chronic kidney disease was 105 people (0.35%) with total sample of 29,956 people. The hypertension in the sample was more than number of chronic kidney disease which equal to 15,534 people (51.9%). The low blood pressure had accelerated chronic kidney disease. The chronic kidney disease in older age was related with lack of blood pressure control [18]. The salty food consumption and smoking status also affected the hypertension. Nevertheless, the salty food consumption was not significant different on the chronic kidney disease patients and healthy person.

The smoking status mean who suffered chronic kidney disease was 0.44 and who did not suffer chronic kidney disease was 0.34. The smoking habit was a risk on chronic kidney disease in the population about 3640 per 1 million population (31% of chronic kidney disease) [19]. In additions, the smoking habits role in the chronic kidney disease on the population by 10% and alcohol consumption by 4.8% [20].

4 CONCLUSION

The number of chronic kidney disease incidents in the population ≥25 years old for 22 years (2013-2035) in Indonesia was estimated 2116 persons (6.07) with multiple of 20.15 times. The chronic kidney disease incidents decreased in the population aged ≥25 years old for 22 years (2013-2035) in Indonesia if metabolic syndrome influenced chronic kidney disease had controlled on simulation model VII, which controlled on obesity and hypertension prevalence about 730 persons. Most suitable strategy on reducing chronic kidney disease incidents was on simulation model VII by reduced the obesity 8.3% and hypertension 15.8% which suppressed the increment rate of chronic kidney disease patients by 13.2 times from initial condition without control.

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