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Submission date: 07-Apr-2022 06:40AM (UTC+0700)

Submission ID: 1803795754

File name: 1. Survival analisis.pdf (472.01K)

Word count: 3193

Character count: 17534

Survival Analysis of Chronic Kidney Failure with a History of Degenerative Disease

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Abstract

Survival analysis is a statistical procedure for analyzing data with variables that are in focus is time until an event occurs. Kaplan-Meier is one simple method to describes a survival curve. Chronic Kidney Disease (CKD) is the 18th cause of death in the World. CKD has been classified as number two catastrophic disease after heart disease. Many studies have been conducted on the survival of CKD patients, but there have not been many studies on CKD based on degenerative disease. The study want to assess the survival of hemodialysis patients with degenerative comorbidities. This retrospective non-reactive design cohort study uses the right sensor. 34 samples were selected according to the inclusion criteria from 155 populations through simple random sampling. Secondary data were taken from the medical record at 2010 to 2015. The estimated survival of CKD patients with degenerative diseases in men reaching 144 weeks and women 132 weeks, patients with a basic education of 112 weeks and an advanced education of 180 weeks, patients working 132 weeks and not working 212 weeks, patient normal nutrition 200 weeks and abnormal 112 weeks. Need screening efforts on CKD, increased endurance, regular exercise and maintenance of nutritional status in hemodialysis patients.

Keywords: Survival Analysis, Chronic Kidney Failure, History of Degenerative Disease, Kaplan-Meier, Hemodialysis Patient.

Introduction

Survival analysis is a statistical procedure for analyzing data with variables that are in focus is time until an event occurs¹. One of the simplest and easiest method of survival analysis is Kaplan Meier. It does not require too much data, only describes the survival curve and descriptive analysis. Descriptive analysis in survival data must be done statistically, because the differences that appear descriptively are not necessarily descriptive. The statistical test used is the Log Rank test. It can show the differences between categories in each factors².

Chronic Kidney Disease (CKD) is a public health problem throughout the world³. The prevalence and

incidence of CKD continues to increase, as a poor prognosis and requires high medical costs. The Global Burden of Disease in 2010 report CKD was the 27th leading cause of death in the world in 1990 and rose to 18th in 2010. In 2016 the global prevalence of CKD reached 13.4%⁴. About 1 in 10 global populations experience CKD at a certain stage. In Indonesia, the treatment of kidney disease is the second largest ranking of financing from BPJS after heart disease. East Java, including number 2, has the highest prevalence of kidney failure, which is 0.3% higher than the national average⁵, which is 0.2%⁴. This increase is same with the increasing number of elderly people, the incidence of diabetes mellitus and hypertension.

The number of patients with CKD at Ibnu Sina Gresik General Hospital in 2012 reached 481 patients and experienced an increase every year⁶. Risk factors for CKD include age, gender, history of diabetes mellitus, and a history of consumption of supplemental drinks⁷. Other opinions describe sex, hypertension, diabetes, gout, traditional drug use and a history of kidney stone

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disease as risk factor of CKD^{8,9} there is relationship between kidney failure and a history of hypertension, diabetes mellitus, urinary tract infections and urinary tract stones.¹⁰ obesity can increase risk factors for CKD.¹¹ The high body mass index have the potential for kidney failure. Indonesian Ministry of Health, 2017 reports that triggering chronic kidney failure is Diabetes mellitus, Hypertension, Chronic Glomerulonephritis, Chronic Intersial Nephritis, Polycystic Kidney Disease, Obstruction, Urinary Tract Infection, Obesity, and unknown causes. Indonesian Renal Registry (IRR), (2017) has report from January to October 2016, there were 44.2% of dialysis service facilities in Indonesia that sent data.

Hypertensive kidney disease increased to 37% followed by diabetic nephropathy by 27%¹². Diabetes mellitus (DM) was included in the second cause after hypertension in CKD cases.¹³, reported the prevalence of diabetics in Indonesia was 5.7%, but only 26.3% had been diagnosed. This condition is an obstacle in establishing a diagnosis of CKD based on co-morbid diseases, especially DM which certainly requires prior investigation. Risk factors for hypertension and DM are the focus of the study in this study because it has the potential to cause damage to various organ systems if not handled properly.¹⁴ reported the explanatory research that blood sugar levels of 2 hours post fasting independently influence the incidence of terminal renal failure in DM patients.

The highest number is still patients with Hypertensive Kidney Disease (E4), as in previous years. This still needs to be evaluated with regard to the

possibility of shifting trends in world epidemiological data, although it is still possible that in Indonesia the etiological distribution of dialysis patients is indeed not similar to other countries.

Method

This study is a non-reactive study, with a type of observational analytic study. Using a retrospective cohort design. Observations use the right sensor calculation (*Right Censoring*). Independent variables of diabetes mellitus and hypertension influence the response variable, namely survival of hemodialysis patients.

The population in this study were 155 new patients at Hemodialysis Poly Ibnu Sina Gresik Hospital. This study uses secondary data of patients' medical records from 2010 to 2015. Inclusion criteria are patients with renal failure who have two degenerative concomitant diseases (hypertension and diabetes mellitus). The sampling technique used was simple random sampling, with a sample size of 34 people. The instruments in this study use the form of data collection sheet and checklist.

Result

2 The relationship identification between the response and the predictor variables using the Kaplan-Meier method. Failure survival function expressed as reaching failure event (death) and the rate of failure to achieve the death is expressed as a function of hazard. Estimated survival function and hazard function performed by Kaplan-Meier. Characteristics of patient and statistic value can be showed on the table 1.

Table 1: Characteristics of Hemodialysis Patients Based on Degenerative Diseases

Characteristics		Status		Median of Survival			P-value
		Censor	No Censor	Estimation	95%		
					Lower Bound	Upper Bound	
Gender	1. Man	7	14	144.00	89.985	198.015	0.892
	2. Woman	5	8	132.00	18.318	245.682	
1 Education	1. Basic Education (Primary School to Senior High School)	10	20	112.00	55.192	168.808	0.392
	2. Further Education (Diploma to Doctoral)	2	2	180.00	-	-	
Job Status	1. Work	8	18	132.00	83.688	180.312	0.632
	2. Unwork	4	4	212.00	-	-	
Nutritional Status	1. Normal	7	5	200.00	169.826	230.174	0.074
	2. Abnormal	5	17	112.00	56.022	167.978	

Table 1. 61.7% of hemodialysis patients are male, have a history of primary education (elementary to high school) (88.2%), work (76.5%), have abnormal nutritional (64.7%).

The female patient have a higher chance of survival than male. Log-Rank test results $p\text{-value} > 0.05$, explain there was no difference in survival time between female and male. Statistically the survival time of male patients is estimated at 144 weeks, while the female reaches 132 weeks. There are differences in the survival life of male and female, the survival life of male hemodialysis patients is 12 weeks higher than women.

Hemodialysis patients with advanced education have a higher survival than primary education (elementary to high school). The results of the Log-Rank test, obtained $p\text{-value} > 0.05$, meaning that there was no differences in survival time of the basic education and the advanced education. Statistically the survival time of hemodialysis patients with advanced education levels has an estimated

180-week and primary education have an estimated 112-week. Hemodialysis patients with working status have a higher likelihood of survival than non-working status. Log-Rank test results $p\text{-value} > 0.05$, there was no difference in the survival time of the working and not working patient. Statistically the survival time of working patient is an estimated 132 weeks and non-working patient have an survival time of 212 weeks.

Hemodialysis patients with normal nutritional had a higher survival than abnormal nutritional. Log-Rank test results $p\text{-value} > 0.05$, show there was no difference in survival time of normal nutritional and abnormal nutritional. Statistically the survival time of normal nutritional has an estimated of 200,000 weeks, while the abnormal nutritional reach 112,000 weeks. So the survival time of hemodialysis patients with normal nutritional is higher. The following figure is the Kaplan-Meier analysis curve based on the predictor variables of hemodialysis patients:

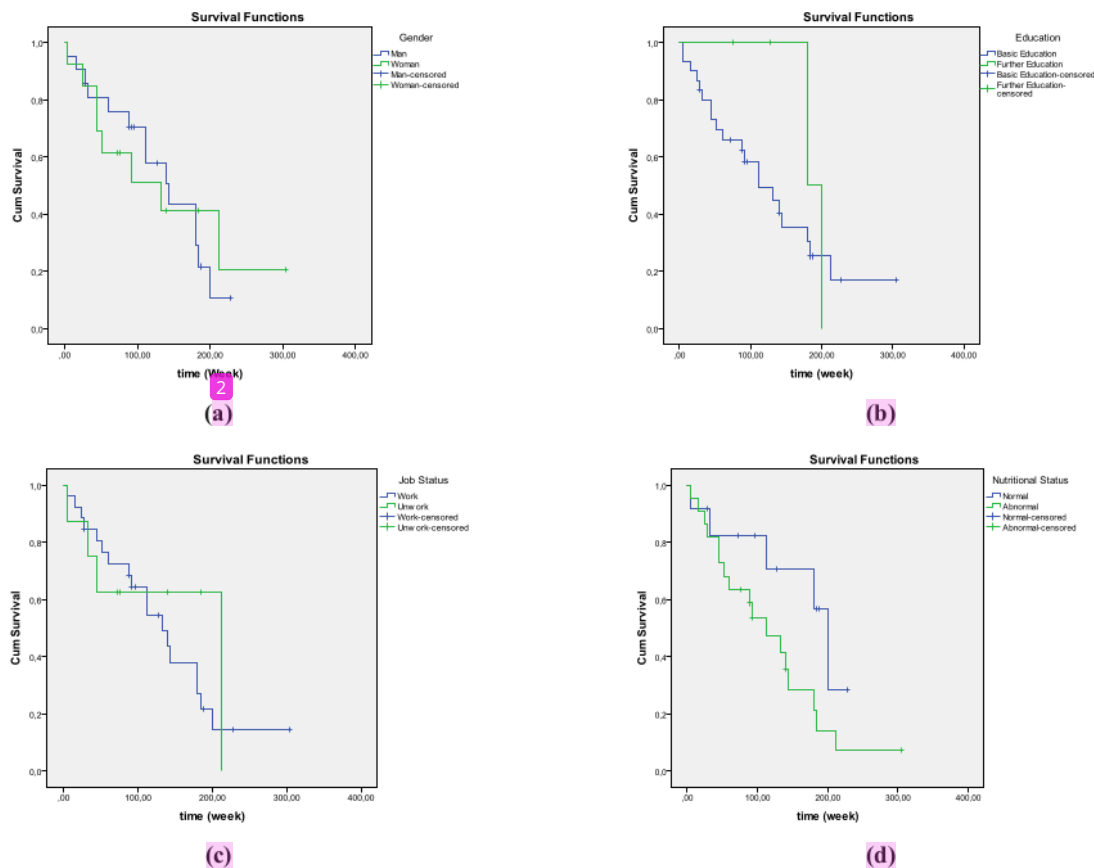


Figure 1. The Results of Kaplan-Meier Analysis (a) Gender, (b) Education, (c) Job Status, (d) Nutritional Status.

Figure 1. Kaplan-Meier curves showed there is a difference in time between two categories, but the curve is merely subjective. Based on statistical values, the Log-rank statistics show the significant variables were gender, Education, Job Status and Nutritional Status. It is concluded that there are no differences in survival time.

Discussion

Hypertension and diabetes mellitus (DM) are the factors that cause death of hemodialysis patients in Ibnu Sina General Hospital. The results of this study were similar with the research that there is a relationship between kidney failure and a history of hypertension, DM, urinary tract infections and urinary tract stones. It has reported that 78.9% of CKD patients have hypertensive comorbidities. Likewise, it is stated that hypertension, diabetes, gout, can affect the occurrence of chronic kidney failure.

The research of¹⁶, explained patients with CRF caused by DM nephropathy reached 21.9%.¹⁷ reports that 30% of CKD patients have DM and 70% are caused by non-DM. The results of this study also reported that the characteristics of hemodialysis patients, allegedly contributed to the incidence of CKD. According to⁸, age, gender, hypertension, diabetes, gout, traditional drug use and a history of kidney stones can affect the occurrence of CKD.¹⁸ explain CKD causes were glomerulonephritis, chronic infections, vascular disease (nephrosclerosis), obstruction (calculi), collagen disease (systemic lupus), nephrotic agents (amino glycosides), endocrine disease (diabetes).¹⁹, show CKD were caused by infection such as chronic pyelonephritis, inflammatory diseases such as glomerulonephritis, hypertensive vascular disease such as benign nephrosclerosis, malignant nephrosclerosis, renal artery stenosis, connective tissue disorders such as systemic lupus erythematosus, polyarteritis nodosa, progressive systemic sclerosis, congenital and hereditary disorders such as polycystic kidney disease, renal tubular acidosis, metabolic diseases such as DM, gout, hyperparathyroidism, amyloidosis, toxic nephropathy eg analgesic abuse, lead nephropathy, obstructive nephropathy such as upper urinary tract calculi neoplasm, retroperitoneal fibrosis.⁷ explain that age, gender, history of DM, and a history of consumption of supplement drinks are risk factors for CKD.

The majority of hemodialysis patients with degenerative diseases were male, had basic education, worked and had abnormal nutritional status. The male

patients have a higher survival than female patients. This fact is in line with the Ministry of Health's statement (2017), the prevalence of CKD in men (0.3%), higher than women (0.2%). The trigger factors as background of this fact are the late recognition of early disorders of the kidneys, because CKD initially does not show typical symptoms. Signs and symptoms that arise from kidney disease are very common and can be found in other diseases such as high blood pressure, changes in the frequency of urination in a day, the presence of blood in urine, nausea, vomiting and swelling especially in the feet and ankles.⁴ In addition²⁰ states that the characteristics of chronic renal failure in women are slower, and also the occurrence of psycho-socioeconomic barriers such as low awareness of women related to kidney disease and low family income as a cause of female dialysis delay. This condition eventually led to lower prevalence of hemodialysis in women compared to men.

Patients with advanced education levels have higher survival than primary education. This fact is related to the level of understanding of patients which has an impact on patient compliance both in treatment and in patient health care. This result is the same with²¹ research that reported the relationship between the level of education and patient compliance in limiting fluid intake in patients with chronic renal failure with p value 0.019.²² showed patients with a higher level of education will have broader knowledge and also enable patients to control themselves in dealing with problems they face, have high self-esteem and understand what is suggested by health workers.

The hemodialysis patients who do not work have a longer life than work. It was related to the mind burden of working hemodialysis patients.²³ reported that depression can affect immunological function, nutrition, and compliance factors that can affect prescription and administration of dialysis. Depression can be an independent factor in influencing the survival of hemodialysis patients. Physical activity actually affects the survival of hemodialysis patients, as stated by²⁴ who reported that there was a relationship between exercise 4 to 5 times a week with an increase in survival life of dialysis patients.²⁵ explain that low income jobs are prone to cause infections because there is a tendency to consume poor quality of foods.

Patients with normal nutritional have higher survival than abnormal nutritional.²⁵ stated that good energy intake would not cause nausea and vomiting. The in

adequacy of energy continuously will cause the protein to be broken down into an energy source and cause an increase in the remaining protein metabolism in the form of blood urea. Protein requirements for CKD that get hemodialysis treatment are higher than CKD without hemodialysis. Protein requirements are used to maintain nitrogen balance and replace amino acids lost during the dialysis process. Protein plays an important role as a result of the accumulation of prenatal catabolism in the body when symptoms of uremic syndrome occur ²⁶

Conclusions

The estimated survival time for male hemodialysis patients is 144 weeks, and women reach 132 weeks, hemodialysis patients with advanced education levels have an estimated 180-week survival time and 112-week for primary education level, working hemodialysis patients have an estimated 132 weeks and not working reach 212 weeks, hemodialysis patients with normal nutritional have an estimated 200 weeks survival time, and abnormal nutritional reaches 112 weeks.

Suggestions: This research is expected to be used as a reference and initial screening for health workers in dealing with chronic renal failure through counseling especially for patients with chronic renal failure with a history of degenerative diseases. providing health education to the community, routine follow-up to working patients, increasing endurance, routine exercise and maintaining nutritional status in hemodialysis patients and can be used as a reference for future studies with variables that have not been studied.

Ethical Clearance: Taken from Health Research.

Ethics Committee: Public Health Faculty, Airlangga University, Indonesia.

Source of Interest: Nill

Conflicts of Interest: Nill

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