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Original Article

Probability of Dying and Survival Analysis of Diabetic and/Hypertensive Patients who Undergone Hemodialysis with Heart Disease Complication: A Comparison between a Hemodialysis Center Jakarta, Indonesia and Penang, Malaysia

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ABSTRACT

Background: Probability of dying of hemodialysis patients can also be caused by heart disease complication. Indonesia and Malaysia are neighbouring countries which might have different pattern in probability of dying and survival analysis of diabetic and / hypertensive patients who undergone hemodialysis with heart disease complication. **Objective:** To compare probability of dying and survival analysis hypertensive and / diabetic patients who undergone hemodialysis with heart disease complication in Hemodialysis (HD) center Jakarta, Indonesia and Penang, Malaysia. **Methods:** A cohort prospective study was done among inclusion criteria patients who had been followed up for 9 months. Universal sampling was used to select those hemodialysis patients. **Results:** There was significant relationship between probability of dying and heart disease comorbidity among hemodialysis patients in HD center Jakarta, Indonesia (hazard: -0.98, hazard ratio: 0.38, 95%CI for hazard ratio: 0.15-0.98, $P < 0.05$), while no significant relationship was found between probability of dying and heart disease comorbidity among hemodialysis patients in HD center Penang, Malaysia (hazard: -1.19, hazard ratio: 0.31, 95%CI for hazard ratio: 0.03-2.74, $P > 0.05$). **Conclusion:** Heart disease was one of the risk factors which caused mortality in HD center Jakarta, Indonesia and the percentage to survive for hemodialysis patients who had heart disease in HD center Jakarta was lesser than the patients who did hemodialysis in HD center Penang, Malaysia.

Key words: Probability of Dying, Survival Analysis, Hemodialysis, Indonesia, Malaysia.

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INTRODUCTION

Diabetic and hypertensive are the main causes of hemodialysis.[1,2] Recently, not only prevalence of hemodialysis increases but mortality among hemodialysis also rises. One of the factors in increasing mortality is comorbidities. Heart disease is one of comorbidities which always be found among hemodialysis patients.[3]

Among hemodialysis patients, heart disease can be caused by hypertensive, dyslipidemia and hyperparathyroidism. Heart disease among these patients can be chronic heart failure or ischemic heart disease. High blood glucose level will increase risk factor for those patients to have heart disease. High osmolality from the blood glucose will make the blood flow slow and it increases risk of clothing in heart vessel (heart problem).

Taking care of the risk factors of heart disease will minimize heart disease comorbidity. Compliance and apply the good lifestyle are the things to reduce complication of heart disease. If patients have diagnosed heart disease, giving big attention to this disease is very important while this disease dominates the cause of mortality among these hemodialysis patients.

MATERIAL AND METHODS

The study included hemodialysis patients who had heart disease and had followed up for 9 months. Universal sampling was used to select 178 patients from a HD center Jakarta, Indonesia and 78 patients from a HD center Penang, Malaysia who fulfilled the inclusion criteria. Cox-regression was used to analyze probability of dying among hemodialysis center in both HD center, Jakarta, Indonesia and Penang, Malaysia and Kaplan-Meiyer analysis to determine the percentage of survival among these patients. A cohort prospective study;

Inclusion criteria: 1) All hemodialysis patients who have diabetic and/ hypertensive
2) Patients ≥ 18 years

Exclusion criteria: 1) Patients < 18 years
2) Cancer patients
3) Pregnancy patients
4) HIV/AIDS Patients
5) Systemic Lupus Erythema Patients

Ethical clearance were sourced from ethical medical committee from Faculty of Medicine in Indonesia and Committee Research Center (CRC) Pulau Pinang, Malaysia. Data collection conducted after receiving of approval letter.

RESULTS

Table 1. shows probability of dying among diabetic and/or hypertensive patients who undergone hemodialysis between both HD centers while the significant relationship is showed in a HD center Jakarta, Indonesia.

Significance relationship is shown between dyslipidemia and distance of heart disease from initiating of HD among hemodialysis patients who had been followed up for 9 months in a HD center Jakarta, Indonesia ($P < 0.05$) as shown in Table 2 otherwise the prevalence of dyslipidemia was higher in a HD center Penang, Malaysia.

Table 1: Correlation between Heart Disease Complication and Probability of Dying (Cox-Regression) among Hypertensive/Diabetic Patients who Undergone Hemodialysis (Prospective Sample/9 Months Followed up)

Potential Comorbidities / Complications	B		Exp (B) Hazard Ratio		95% CI For Exp (B)		P Value	
	Jakarta, Indonesia	Penang, Malaysia	Jakarta, Indonesia	Penang, Malaysia	Jakarta, Indonesia	Penang, Malaysia	Jakarta, Indonesia	Penang, Malaysia
Heart Disease	-0.98	-1.19	0.38	0.31	0.15-0.98	0.03-2.74	0.04*	0.29

Table 2: Correlation between dyslipidemia and distance of Heart Disease from Initiating of HD among Hemodialysis Patients Who Had Been Followed up for 9 Months in a HD center, Jakarta, Indonesia and Penang, Malaysia

Item	N (Mean ± SD) No	N (Mean ± SD) Yes	P*
Dyslipidemia (Indonesia)	176 (0.74±2.41)	6 (2.17±2.14)	0.001*
Dyslipidemia (Malaysia)	33 (2.09±3.70)	45(3.24±6.02)	0.91

* A Man-Whitney U Test

Table 3: Correlation between duration of hypertensive and duration of diabetic for distance of Heart Disease among Hemodialysis Patients Who Had Been Followed up for 9 Months from Initiating of HD in a HD center, Jakarta, Indonesia and Penang, Malaysia

Items	N for each group	Mean±SD for each group	P*
Duration of hypertensive (Indonesia)	≤ 5 years (117)	0.38 ± 0.99	0.02*
	> 5-10 years (34)	1.03 ± 2.88	
	>10-15 years (14)	1.07 ± 1.86	
	>15-20 years (6)	3.00 ± 6.87	
	>20 years (7)	4.00 ± 6.22	
Duration of diabetic (Indonesia)	Never (96)	0.74 ± 2.54	0.61
	≤ 5 years (26)	0.92 ± 3.32	
	> 5-10 years (22)	0.86 ± 1.42	
	>10-15 years (17)	0.76 ± 1.71	
	>15-20 years (8)	0.25 ± 0.46	
	>20 years (9)	1.22 ±2.28	
Duration of hypertensive (Malaysia)	≤ 5 years (6)	0.17 ± 0.41	0.26
	> 5-10 years (26)	1.85 ± 2.91	
	>10-15 years (20)	1.95 ± 2.87	
	>15-20 years (13)	6.46 ± 9.38	
	>20 years (13)	3.31 ± 3.62	
Duration of diabetic (Malaysia)	Never (43)	3.35 ± 6.31	0.67
	≤ 5 years (5)	0.60 ± 0.89	
	> 5-10 years (8)	1.13 ± 2.80	
	>10-15 years (11)	2.73 ± 3.32	
	>15-20 years (5)	4.20 ±5.22	
	>20 years (6)	1.33 ± 2.42	

* A Kruskal-Wallis Test

Table 4: Correlation between distance of heart disease from initiating of HD and frequency of HD from initiating of HD among Hemodialysis Patients Who Had Been Followed up for 9 Months in a hemodialysis center Jakarta, Indonesia, and Penang, Malaysia

Items	P value*
The distance of heart disease from initiating of HD and frequency of HD from initiating of HD (Indonesia)	P < 0.001*
The distance of heart disease from initiating of HD and frequency of HD from initiating of HD (Malaysia)	P < 0.001*

*Wilcoxon Signed Rank Test

Table 5: Correlation between total cholesterol, triglyceride, LDL-cholesterol, HDL-cholesterol, FBS, HB,sodium pre-post, potassium pre-post (baseline, first followed up, second followed up) and distance of heart disease from initiating of HD among Hemodialysis Patients Who Had Been Followed up for 9 Months in a hemodialysis center Penang, Malaysia

Items	P value*
Total cholesterol	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
Triglyceride	
Baseline	P >0.001
First followed up	P >0.001
Second followed up	P > 0.001
LDL-cholesterol	
Baseline	P > 0.001
First followed up	P > 0.001
Second followed up	P > 0.001
HDL-cholesterol	
Baseline	P > 0.001
First followed up	P >0.001
Second followed up	P >0.001
FBS	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
HB	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
Sodium-Pre	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
Sodium-Post	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
Potassium Pre	
Baseline	P < 0.001*
First followed up	P < 0.001*
Second followed up	P < 0.001*
Potassium Post	
Baseline	P >0.001
First followed up	P >0.001
Second followed up	P >0.001

*Wilcoxon Signed Rank Test

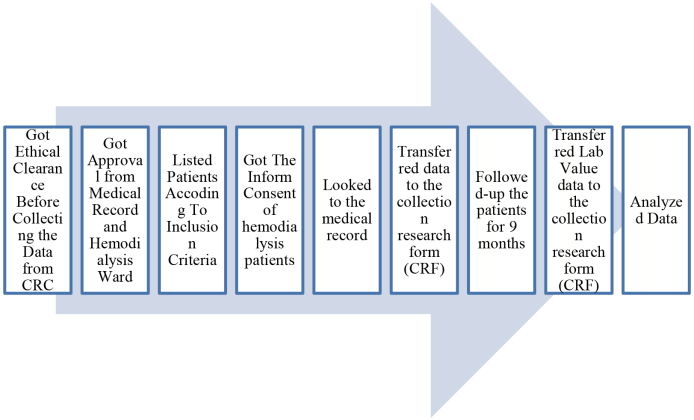

Figure 1: Research Framework.

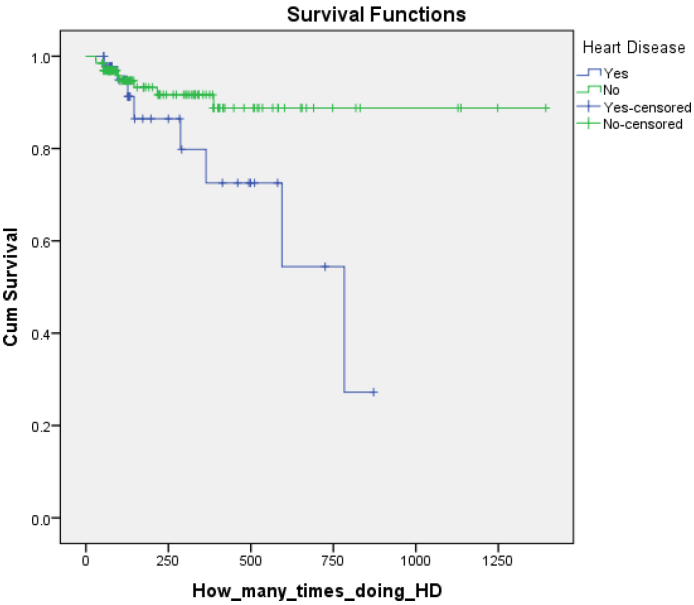

Figure 2: Survival Analysis of Heart Disease Patients Based on the Duration/ Session of Hemodialysis Among Hemodialysis Patients Who Had Been Followed up for 9 Months in a HD Center Jakarta, Indonesia.

Table 3. shows relationship between duration of hypertensive and duration of diabetic for distance of heart disease from initiating of HD among hemodialysis patients who had been followed up for 9 months in a HD center Penang, Malaysia. Significance relationship was found in a HD center Jakarta, Indonesia ($P < 0.05$) as shown in Table 3.

Table 4 shows relationship between distance of heart disease from initiating of HD and frequency of HD from initiating of HD among hemodialysis patients who had been followed up for 9 months in a HD center Penang, Malaysia. Significance relationship was found in a HD center Jakarta, Indonesia and Penang, Malaysia ($P < 0.001$) as shown in Table 4.

Significance relationship was found between baseline, first and second followed up of total cholesterol, FBS, HB, sodium-pre, sodium-post, potassium-pre for distance of heart disease from initiating of HD among hemodialysis patients who had been followed up for 9 months in a HD center Penang, Malaysia ($P < 0.001$) as shown in Table 5. In a HD center Jakarta, Indonesia, analysis of laboratory value among those hemodialysis patients could not be done due the incomplete laboratory examination results.

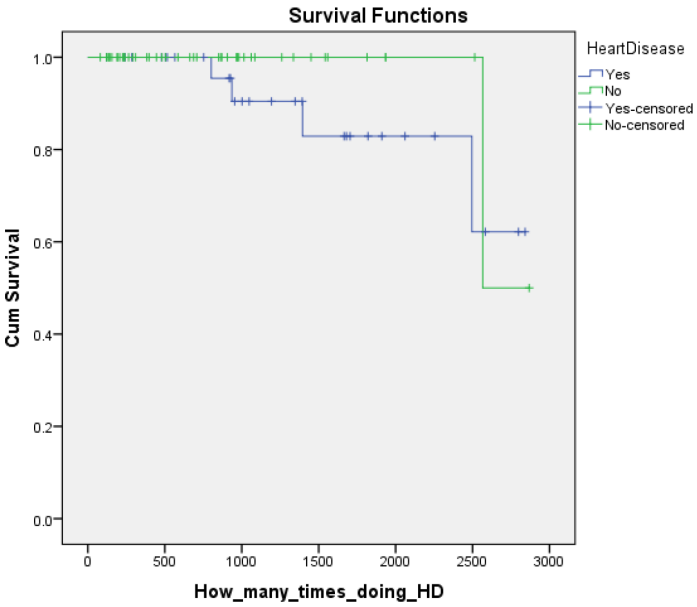

Figure 3: Survival Analysis of Heart Disease Patients Based On the Duration/ Session of Hemodialysis Among Hemodialysis Patients Who Had Been Followed up for 9 Months in a HD Center Penang, Malaysia.

Figure 1. Shows significant correlation of survival analysis of hemodialysis patients who had heart disease and had not for duration/session of hemodialysis in a HD center Jakarta. In the beginning of hemodialysis session, percentage of survival for these groups was difference while for those patients who had not heart disease had 90 percent of survival since they had done hemodialysis session around 500 times but for those patients who had heart disease had around 22 percent of survival since they had done hemodialysis session around 760 times. These patients did hemodialysis two times per week for 4.5-5 hr per session.

Figure 2. Shows around 60 percent survival was found among hemodialysis patients who had heart disease since they had done hemodialysis session around 2500 times in a HD center Penang, Malaysia while those patients did hemodialysis 3 times in a week for 5 hr per session.

DISCUSSION

Dyslipidemia is one of the causal factors of heart disease.[4] Hypertensive is also a part of heart disease while almost all hemodialysis patients who have heart disease have hypertensive.[5] Those things may influence the frequency of HD from initiating of HD.

According to the some literatures, abnormality of cholesterol products (total cholesterol, LDL-cholesterol, HDL-cholesterol and triglyceride) and fasting blood sugar (FBS), sodium, potassium and hemoglobin will give impact to the heart disease,[4,6,7] but only few literatures found about this.

Heart disease is the main risk factor which cause mortality among hemodialysis patients.[8,9] Diabetes mellitus status, history of cardiovascular events and dialysis time per session were included to a new prognostic prediction model of composite cardiovascular events tailored for hemodialysis patients.[10] Dyslipidemia is one of the risk factors which will also cause heart disease.[4] From the survival analysis Kaplan-Meier, in a HD center Penang, Malaysia, the percentage of survival of hemodialysis patients with heart disease complication is more than 60 percent since those patients passed 2500 times hemodialysis. It gives indication that those patients can survive longer although they had this complication but it is different with a HD center Jakarta, Indonesia, while since those

patients done 750 times hemodialysis, the percentage of survival is only 30 percent.

Significantly study of probability of dying due to the heart disease should be appeared also in a HD center Penang, Malaysia while 45 of 78 diabetic and/hypertensive patients who undergone hemodialysis in this HD center had dyslipidemia. The proper medication, the regularly laboratory checked, the good control of the disease and the proper followed up of the patient's medication progress might minimize the probability of dying due to this complication.

Diabetic and / hypertensive patients who undergone hemodialysis in a HD center Jakarta, Indonesia did not have the complete laboratory checked results while checking of laboratory value was conducted when patients needed only. It can give impact for the progress of the medication, moreover, those patients did hemodialysis 2 times in a week and it gave the big chance for the overload of body fluid. Cardiovascular system would be disturbed due to of that issue.

CONCLUSION

Heart disease is one of the causes of death among hemodialysis patients in a HD center Jakarta, Indonesia. It can be seen by significance relationship between hemodialysis patients with heart disease complication and probability of dying. Hemodialysis patients in this HD center also has the lesser chance to survive in longer time compare hemodialysis patients in a HD center Penang, Malaysia. Duration of hemodialysis the patients gotten could be one of the factors, which increased the risk factor of dying due to heart disease. Excessive fluid in the body exacerbated the burden of heart. Besides that, those patients got incomplete laboratory examination results and it gave the big impact to the treatment progress.

CONFLICTS OF INTEREST

No conflict of interest among authors.

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