Comparison of the Relative Risk of Different Dialysis Modalities in Septicemia and the Risk Factors

Wen-Chen Tsai[1], Shang-Jyh Chiou[2], Pei-Tseng Kung[2], Kuang-Hua Huang[1], Yu-Chia Chang[2]

[1]Department of Health Services Administration, China Medical University, No.91, Hsueh-Shih Road, Taichung, Taiwan 40402, Taiwan, R.O.C.

[2] Department of Healthcare Administration, Asia University, 500, Lioufeng Rd. Wufeng, Taichung City, 41354, Taiwan, R.O.C

Abstract- *The purpose of this study is to compare the risk of incident septicemia for different dialysis modalities in Taiwan. The study subjects are the newly diagnosed dialysis patients from 1997 to 2007 in Taiwan. The observational period will be extended to the end of 2009. The data are obtained from the medical claim dataset of National Health Insurance published by National Health Research Institutes. A total of 80,855 incident dialysis patients are included.*

Keywords- dialysis, dialysis patients, septicemia, hemodialysis, peritoneal dialysis

I. INTRODUCTION

Dialysis patients are prone to infection due to their immune deficiency. Infection is the second leading cause of mortality in dialysis patients in the United States.[1] In Taiwan, we had similar situations. A single hospital study showed infection was the leading cause of mortality and accounted for 50% of death among the dialysis patients in Taiwan.[2] The reasons for predisposing to infection are alterations in primary host defense, older age, comorbid conditions such as diabetes mellitus, malnutrition, and quality of care such as dialysis procedures and nosocomial transmission.[3,4] Bacteremia, peritonitis, vascular access infection, pneumonia, and cellulitis are the common types of infection for dialysis patients.[1]

A recent study in the United States showed that there was no significant difference between HD and PD patients in the overall infection rate.[5] However, HD patients had a higher risk of bacteremia, and PD patients had a higher risk of peritonitis. The study for dialysis patients in Australia and New Zealand also reported that the incidence rate of sepsis mortality was not significantly different between HD and PD patients.[6] Septicemia in dialysis patients was associated with a poor prognosis,[7,8] and bacteremia was associated with subsequent death.[7]

Since study on risk of septicemia in dialysis patients is scarce for Asia population, this study will use a nationwide dataset to compare the incidence rate of septicemia between HD and PD patients and examine the risk factors for septicemia in Taiwan.

II. METHODS

Study subjects and data sources

The study conducted a nationwide longitudinal cohort study of the incidence and risk factors for septicemia in end-stage renal disease (ESRD) patients. The newly diagnosed dialysis patients from 1997 to 2009 were the study subjects. The study included the dialysis patients who have received dialysis treatment for at least three months. The data are obtained from

the medical claims dataset of National Health Insurance published by the National Health Research Institutes. We initially excluded patients with missing information on age and sex. A total of 80,855 incident dialysis patients were included. The study subjects consisted of 76,172 hemodialysis patients and 4,683 peritoneal dialysis patients.

Definition of variables and outcome measure

The outcome variable was admission to the hospital for septicemia. The study defined the septicemia as dialysis patients having a primary International Classification of Disease-9th Modification diagnosis code of 038.xx (septicemia) or 790.7 (bacteremia) on the medical claims dataset. We only included the patients having primary diagnosis code of septicemia. This study also required that repeat hospital admissions for septicemia be separated by at least 30 days.

The study had some important relevant factors in the analysis, including patient characteristics (i.e. sex, age, area of residence), socioeconomic status (i.e. premium-based monthly salary), comorbid conditions (e.g, diabetes mellitus, glomerulonephritis, neoplasm, etc.), physician characteristics (e.g., sex, age, annual dialysis patient volume), and hospital characteristics (e.g., level of hospital, ownership status, annual dialysis patient volume). Physician's patient volume or hospital's patient volume was calculated with number of dialysis patients yearly, and was divided into three levels (i.e. high, medium, low) using an interquartile range.

Statistic methods

First, the study conducted descriptive analysis and bivariate analysis for the relevant variables and outcome variable. The incidence rate of septicemia between HD and PD patients over the follow-up period will be compared using the Wilcoxon rank sum test. We also will examine the correlation between septicemia status and relevant variables using Chi-square test. Finally, we will use multivariate logistic regression with general estimating equation (GEE) approach to estimate the relative risk of septicemia between HD and PD patients after adjusting for other risk factors. The study will also examine the patient characteristics, physician characteristics, and hospital characteristics in the risk of septicemia for dialysis patients.

III. On-going Work

In Table 1, the study results show the relationships between septicemia status and the relevant variables. Peritoneal dialysis patients had lower rate (3.99%) of suffering from septicemia than that of hemodialysis patients (10.20%). We will analyze the incidence rate of septicemia for HD and PD patients in 1997-2007, and further perform multivariate logistic regression with GEE approach to examine the relative risk of different dialysis modalities and the relevant risk factors.

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Table 1. Bivariate Analysis for Study Subjects

Variables	Septicemia		No Septicemia		χ^2
	N=7964	%	N=72891	%	P value
Dialysis modality					<0.001
Hemodialysis	7,777	10.20	68,395	89.79	
Peritoneal	187	3.99	4,496	96.01	
Sex					<0.001
Male	3,453	8.80	35,780	91.20	
Female	4,511	10.84	37,111	89.16	
Age					<0.001
≦44	397	3.91	9,746	96.09	
45~54	827	6.15	12,611	93.85	
55~64	1,537	9.19	15,182	90.81	
65~74	2,416	12.20	17,386	87.80	
≧75	2,118	15.26	11,764	84.74	
Mean of age	66.47±12.53		60.46±14.47		<0.001
Urbanization of residence area					<0.001
1st	1,206	8.99	12,209	91.01	
2nd	1,844	9.52	17,527	90.48	
3rd	1,317	10.15	11,655	89.85	
4th	664	9.54	6,295	90.46	
5th	1,000	9.65	9,365	90.35	
6th	749	10.97	6,079	89.03	
7th	738	11.91	5,458	88.09	
8th	260	11.65	1,972	88.35	
Premium-based monthly salary(NT$)					<0.001
dependants	3,144	11.78	23,536	88.22	
≦17280	1,555	9.76	14,379	90.24	
17281~22800	2,706	9.43	26,004	90.57	
22801~28800	158	7.27	2,016	92.73	
28801~36300	95	5.44	1,650	94.56	
36301~45800	106	5.05	1,993	94.95	
45801~57800	25	3.42	705	96.58	
≧57801	45	4.91	872	95.09	

Table 1. Bivariate Analysis for Study Subjects (Cont.)

Variables	Septicemia		No Septicemia		χ^2
	N=7964	%	N=72891	%	P value
Comorbid condition					
Diabetes mellitus	3,026	11.64	22,971	88.36	<0.001
Glomerulonephritis	278	9.98	2,507	90.02	0.254
Neoplasm	36	8.24	401	91.76	0.474
Chronic obstructive pulmonary disease	140	11.86	1,040	88.14	0.003
Secondary glomerulonephritis	59	7.87	691	92.13	0.181
Interstitial nephritis	107	13.02	715	86.98	<0.001
Physician characteristics					
sex					0.363
Male	7,205	9.83	66,059	90.17	
Female	713	10.18	6,290	89.82	
Age					<0.001
<35	60	11.28	472	88.72	
35~44	1,594	12.29	11,377	87.71	
45~54	3,791	10.05	33,933	89.95	
55~64	1,891	8.99	19,153	91.01	
≧65	628	7.32	7,956	92.68	
Patient volume					<0.001
High	5,886	10.49	50,222	89.51	
Medium	1,562	8.93	15,924	91.07	
Low	516	7.11	6,745	92.89	
Hospital characteristics					
Hospital level					<0.001
Medical center	2,191	10.84	18,027	89.16	
Regional	2,304	13.72	14,495	86.28	
District	1,549	11.65	11,748	88.35	
Clinic	1,915	6.41	27,978	93.59	
Ownership					0.865
Public	1,603	9.96	14,489	90.04	
Non-public	6,353	9.91	57,737	90.09	
Patient volume					<0.001
High	2,232	11.03	18,000	88.97	
Medium	4,500	10.76	37,335	89.24	
Low	1,232	6.56	17,556	93.44	