

Mortality and Risk Factors in Psychiatric Inpatient with Dementia: A 13-year Long-Term Data Analysis

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ABSTRACT

Objective: The study aimed at identifying mortality and risk factors of psychiatric inpatients with dementia, a 13-year long-term data analysis.

Method: This study adopted retrospective cohort design. The original claims data of 1 million randomly sampled beneficiaries between 1997 and 2010 from Taiwan's National Health Insurance Research Database were analyzed. Mortality risk and risk factors were assessed using Cox regression analysis.

Results: Among 320 dementia patients, a total of 83.4% had Alzheimer disease and 16.6% had vascular dementia. The mortality rates within 1 year after admission were reported for patients with vascular dementia (41.7%) and patients with Alzheimer disease (19.1%). A 1-year increase in age was associated with 3% increase in the risk of hospitalization mortality. Mortality risk among male inpatients was 2.9 times higher than that of female inpatients ($P < 0.001$). The mortality risks among delirium inpatients, those with delusional symptoms, and those with depression had hazard ratios of 2.84 ($P = 0.004$), 2.17 ($P = 0.008$), and 1.82 ($P = 0.075$) respectively, relative to inpatients with uncomplicated symptoms.

Conclusion: The factors that influenced the mortality of dementia patients admitted to the psychiatric department were male sex, old age, delirium symptoms, and delusional symptoms.

Keywords

Dementia, Mortality risks, Uncomplicated, Delirium, Delusional, Depression

Introduction

Worldwide, approximately 47 million people have dementia, and this number is expected to increase to 131 million by 2050. The worldwide cost of dementia is US\$818 billion [1]. According to the demographic statistics released

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by Taiwan's Ministry of Interior in September 2017, 243,430 people aged 65 years or older have dementia; they account for 1.09% of the total population in Taiwan, which means that one in every 100 people in Taiwan has dementia [2].

Dementia is generally degenerative and vascular-based in nature. The most common forms of dementia are Alzheimer disease (AD) and vascular dementia (VaD) [3-5]. According to the Diagnostic and Statistical Manual of Mental Disorders (4th Edition Text Revision) (DSM-IV-TR), dementia is classified by its primary clinical symptoms of accompanying uncomplicated symptoms, delirium, delusions, and depression [4]. Dementia is a combination of symptoms that causes deterioration in memory, language ability, spatial orientation, calculation ability, judgment, abstract thinking ability, and attention. It also leads to behavioral disturbances and personality change, influencing interpersonal relationships and the ability to perform daily living activities [6]. More than 90% of people with dementia develop at least one behavioral or psychological symptom such as sleep problems, paranoia and/or delusions, diurnal disturbance, and aggressiveness during the course of the disease [5,7,8]. Behavioral and psychological symptoms of dementia (BPSD) inflict pain on patients and impose considerable burden on the patients' caregivers and families as well as the society [9,8]. Severe BPSD requires hospitalization for treatment [10], and the primary reasons patients with dementia are admitted to psychiatric wards include defiant behavior (physically or verbally aggressive behavior), hyperactivity (wandering, restless, or repetitive behavior), or apathy and/or depression (loss of appetite, refusal to eat, refusal to take medication, or suicide) [11,12].

Studies comparing the survival rates of patients with or without dementia have demonstrated increased mortality risks among dementia patients [13-15]. A meta-analysis reported that the mortality of patients with dementia was 15.3% compared to 8.7% of the patients without dementia [16]. The average years of survival from dementia ranges from 1 to 13 years, depending on the age, gender, the type of dementia, and the research design. Therefore, family involvement is one critical aspect that needs to be addressed among dementia people, as it will allow the family members to understand the fatal risk and survival life span of dementia, hence they will be able to make plans as needed [17]. Studies that have investigated the mortality rate and factors

of dementia showed that age and gender are possibly related to the mortality rate of dementia and that the mortality rate of dementia increases with age [15,17,18-21]. Other studies have shown that female dementia patients exhibited lower mortality risk than their male counterparts [15,17-24]. Limited studies have compared the different types of dementia and their associated mortality risk, and the results have been inconsistent. Some studies showed that the mortality risk of VAD is higher than AD while other studies showed that the mortality risks of both types are similar. Further, these studies only focused on the community, clinical and outpatient patients [25-28]. Dementia patients who are hospitalized due to psychiatric and behavioural problems have proved to present with severe symptoms than the community, clinical, or outpatient patients. The survival span and the cause of death vary among these patients. However, not much research studies have investigated on this issue. Nonetheless, the research design and the time of follow up may affect the results of dementia mortality risk and survival span. So far, very limited studies have used the long follow-up research design to investigate the various types of dementia, the associated mortality risks and different symptoms among dementia patients following hospitalization in the psychiatric ward. Therefore, this study aims to use 13 years of follow up to investigate different types of dementia along with different symptoms of dementia in the psychiatric ward and its mortality risks and casual factors. This study will report the gender, age, dementia types, accompanying symptoms, mortality risk, and risk factors, along with dementia type, accompanying symptom, the distribution of the time of death and the common disease diagnosis.

Methods

■ Study design

The National Health Insurance (NHI) was implemented in Taiwan on March 1, 1995. The NHI coverage rate is currently more than 99%, covering almost every citizen in Taiwan. Therefore, the NHI database is a representative database containing empirical data that can be used by medical health care communities. The research outcomes obtained using the database can serve as the basis for medical health care policies. In this study, data were sourced from the Longitudinal Health Insurance Database 2005 (LHID 2005) of the National Health Insurance Research Database (NHIRD). LHID

2005 contains the insurance claims data of one million beneficiaries randomly sampled from the NHIRD in 2005. The NHI report showed no significant difference regarding gender, age, and insured salary in the LHID2005 and NHIRD, suggesting that the data in LHID 2005 can represent the parent population. The LHID2005 contains demographic information, hospital admission records, and treatment procedures undertaken. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) was adopted in this study. Data were pseudonymized in a pro-con analysis to protect the privacy of these patients and hence informed consent was waived. This retrospective analysis study was approved by the Joint Institutional Review Board of Tri-Service General Hospital (TSGH IRB No.2-106-05-029).

■ **Study population**

This study obtained one million samples from LHID 2005 (986,713 samples satisfied the inclusion criteria). According to the diagnostic standards in the DSM-IV TR, the International Classification of Diseases, Ninth Revision,

Clinical Modification (ICD-9-CM) code for dementia is 290 (290.4, 290.0, 290.1, 290.3, 290.20, 290.21). The total number of patients admitted to the psychiatric ward was 961. After patients with a history of severe mental illness, those with a history of alcohol or drug abuse (ICD-9: 291, 292, 293, 294, 295, 296, 304), and those with incomplete data (e.g., gender and age unknown) were excluded, data of 320 patients were incorporated for data analysis (**Figure 1**).

■ **Statistical analysis**

Clinical comorbidity index (CCI) scores were calculated before performing data analysis [29]. In the data analysis, continuous variable results were expressed as means and standard deviations, whereas categorical variables were expressed as numbers and percentages. Chi-square was used to analyze the difference between the categorical variables, and continuous variables were compared using one-way analysis of variance (ANOVA). Mortality risk and risk factors were assessed using Cox regression analysis. All statistical analyses were performed using IBM SPSS Statistics 22.0, with $p < 0.05$ being defined as statistically significant.

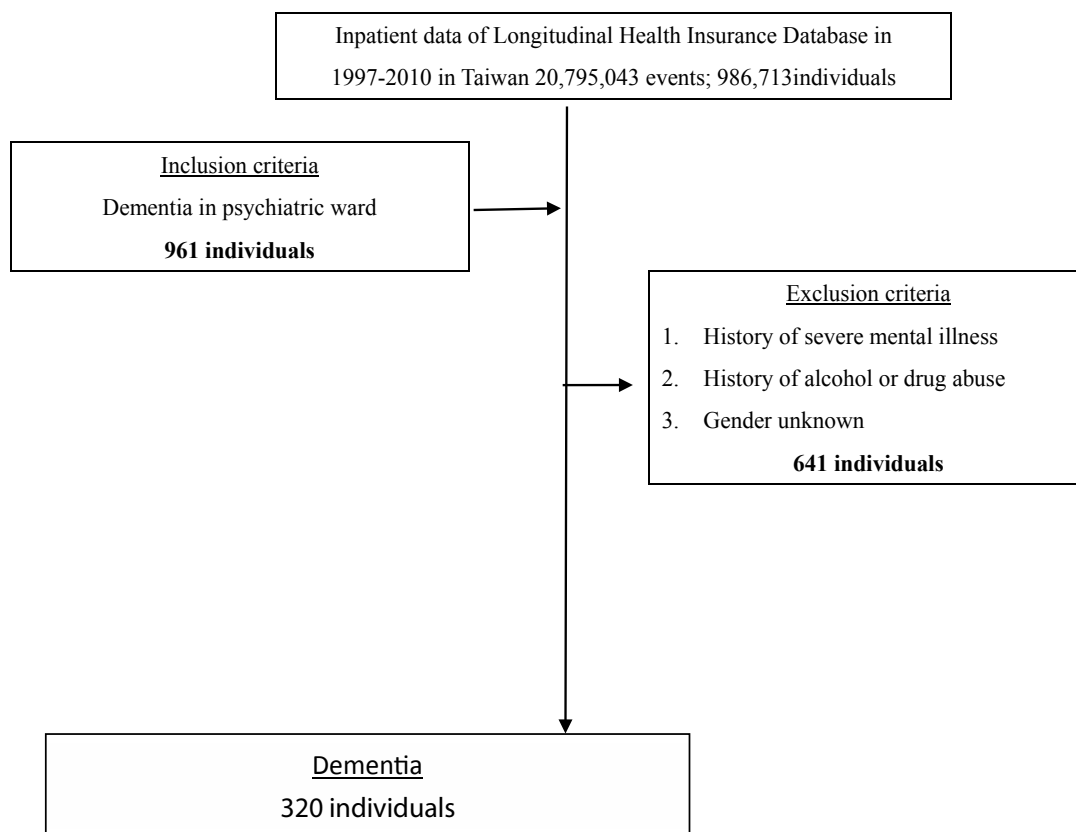


Figure 1: The flowchart of study sample selection from National Health Insurance Research Database in Taiwan.

Results

■ **Demographic characteristics**

Table 1 shows that the 320 patients comprised mostly men (73.8%) and aged between 75 and 84 years (50.0%). Each patient stayed in the hospital for an average of 248.83 days; the average total medical cost amounted to US\$19,483.34; and the average number of times of hospitalization was 9.62 (28 patients (9.1%) were hospitalized only once). Inpatient psychiatric admissions were classified into types of dementia (where AD showed the highest prevalence (83.4%)) and accompanying symptoms (where delusions were observed in most of the patients (48.8%), followed by uncomplicated symptoms (22.5%), depression (15.3%), and delirium symptoms (13.4%)). A total of 101 patients (31.6%) died during hospitalization.

Table 2 presents a gender comparison, showing that male and female patients mostly aged 75–84 years (48.7% vs. 53.6%). Mortality rate for male inpatients was higher than that for female inpatients (26.3% vs. 5.3%, $P=0.009$). The

average length of hospital stay for male patients was 2.43 HR longer than that for female patients (294.2 vs. 121.3; $P=0.001$). The average number of times male patients were hospitalized was also higher than that for female patients (10.9 vs. 6.2; $P=0.001$). The medical cost of male patients was 1.51 HR higher than that of female patients (US\$21,551.6 vs. US\$14,290.8; $P=0.018$). Most male and female patients exhibited AD (72.7% vs. 27.3%) and delusional symptoms (50.4% vs. 44.0%). The research samples were classified by type of dementia into VaD and AD. The number of patients with AD was higher than that of patients with VaD (267 vs. 53). VaD and AD were most prevalent in male patients (79.2% vs. 72.7%). Regarding age distribution, VaD and AD were most prevalent in patients aged 75–84 years (52.8% vs. 49.4%, $p<0.001$), and VaD and AD were least prevalent in patients aged 85 years or older and 64 years or younger, respectively. In terms of accompanying symptoms, VaD was mostly accompanied by uncomplicated symptoms (34.0%) and was least associated with depression (15.1%). AD was mostly accompanied by delusional symptoms (53.2%) and was least associated with delirium (11.2%). Additionally, VaD and AD demonstrated statistically nonsignificant differences in terms of the patients' CCI, total average length of hospital stay, total average medical cost, and average number of times of hospitalization (**Table 3**).

■ **Disease characteristics**

If cases were classified by their primary clinical symptoms into uncomplicated, delirium, delusional, and depressive symptoms and these symptoms were classified by types of dementia, AD was associated with higher rate of uncomplicated, delirium, delusional, and depressive symptoms compared with VaD. In addition, AD and VaD exhibited statistically significant difference ($P=0.001$). Regarding inpatient surgery, the percentage of inpatient surgery was highest among patients with depressive symptoms (22.4%) followed by patients with delusional symptoms (10.3%), and statistically significant difference was observed ($P=0.020$). The average length of hospital stay, medical cost, and number of times of hospitalization were the least for patients with delusional symptoms, and these factors showed statistically significant difference (**Table 4**).

An analysis of 13-year follow-up data revealed that among patients with dementia admitted to the psychiatric department, these patients

Table 1: Social demographic characteristics of patients with dementia who are admitted to the psychiatric department (n=320).

Variables	No. / Mean	% / SD(±)
Gender		
Male	236	73.8%
Female	84	26.3%
Type		
VaD	53	16.6%
AD	267	83.4%
Accompanying symptoms		
uncomplicated	72	22.5%
delirium	43	13.4%
delusional	156	48.8%
depression	49	15.3%
Age (years)		
<64	21	6.6
65-74	56	17.5
75-84	160	50.0
>85	83	25.9
Level of care		
Hospital center	55	17.2%
Regional hospital	122	38.1%
Local hospital	143	44.7%
Surgery		
Without	286	89.4%
With	34	10.6%
Mortality		
	101	31.6%
Charlson Comorbidity Index (CCI)		
	1.21	1.19
Length of days		
	248.83	411.88
Medical cost (US\$)		
	19,483.34	24,050.1
Inpatients times		
	9.62	11.18

Table 2: Social demographic characteristics of patients with dementia who are admitted to the psychiatric department (gender).

Variables	Male n= 236		Female n= 84		p value
	No./ Mean	% / SD(±)	No./ Mean	% / SD(±)	
Type					0.320
VaD	42	79.2%	11	20.8%	
AD	194	72.7%	73	27.3%	
Accompanying symptoms					0.184
uncomplicated	48	20.3%	24	28.6%	
delirium	29	12.3%	14	16.7%	
delusional	119	50.4%	37	44.0%	
depression	40	16.9%	9	10.7%	
Age (years)					0.421
<64	18	7.6%	3	3.6%	
65-74	39	16.5%	17	20.2%	
75-84	115	48.7%	45	53.6%	
>85	64	27.1%	19	22.6%	
Level of care					
Hospital center	38	16.1%	17	20.2%	0.002
Regional hospital	79	33.5%	43	51.2%	
Local hospital	119	50.4%	24	28.6%	
Surgery					0.857
Without	211	89.4%	75	89.3%	
With	25	10.6%	9	10.7%	
Mortality	84	26.3%	17	5.3%	0.009
Charlson Comorbidity Index (CCI)	1.2	± 1.2	1.2	± 1.1	0.783
Length of days	294.2	± 461.9	121.3	± 160.4	0.001
Medical cost (US\$)	21,551.6	± 25,960.8	14,290.8	± 17,682.3	0.018
Inpatients times	10.9	± 12.4	6.2	± 5.3	0.001

Table 3: Social demographic characteristics of patients with dementia who are admitted to the psychiatric department (type).

Variables	VaD n=53		AD n= 267		p value
	No./ Mean	% / SD(±)	No./ Mean	% / SD(±)	
Gender					0.320
Male	42	79.2%	194	72.7%	
Female	11	20.8%	73	27.3%	
Accompanying symptoms					0.001
uncomplicated	18	34.0%	54	20.2%	
delirium	13	24.5%	30	11.2%	
delusional	14	26.4%	142	53.2%	
depression	8	15.1%	41	15.4%	
Age (years)					<0.001
<64	10	18.9%	11	4.1%	
65-74	8	15.1%	48	18.0%	
75-84	28	52.8%	132	49.4%	
>85	7	13.2%	76	28.5%	
Level of care					
Hospital center	12	22.6%	43	16.1%	0.494
Regional hospital	18	34.0%	104	39%	
Local hospital	23	43.4%	120	44.9%	
Surgery					0.857
Without	47	88.7%	239	89.5%	
With	6	11.3%	28	10.5%	
Mortality	12	3.8%	89	27.8%	.126
Charlson Comorbidity Index (CCI)	1.2	±1.1	1.2	±1.2	.906
Length of days	299.2	± 599.1	238.8	± 364.2	.482
Medical cost (US\$)	17,840.5	± 18,530.7	20,003.9	± 25,245.8	.469
Inpatients times	9.9	± 13.5	9.6	± 10.7	.854

Table 4: Social demographic characteristics of patients with dementia who are admitted to the psychiatric department (accompanying symptoms).

Variables	uncomplicated n= 72		delirium n= 43		delusional n= 156		depression n= 49		p value
	No./ Mean	% / SD(±)	No./ Mean	% / SD(±)	No./ Mean	% / SD(±)	No./ Mean	% / SD(±)	
Diagnosis									0.001
VaD	18	25.0%	13	30.2%	14	9.0%	8	16.3%	
AD	54	75.0%	30	69.8%	142	91.0%	41	83.7%	
Gender									0.184
Male	48	66.7%	29	67.4%	119	76.3%	40	81.6%	
Female	24	33.3%	14	32.6%	37	23.7%	9	18.4%	
Age (years)									0.080
<64	8	11.1%	4	9.3%	9	5.8%	0	0%	
65-74	12	16.7%	5	11.6%	24	15.4%	15	30.6%	
75-84	38	52.8%	20	46.5%	78	50.0%	24	49.0%	
>85	14	19.4%	14	32.6%	45	28.8%	10	20.4%	
Level of care									0.090
Hospital center	15	20.8%	3	7.0%	23	14.7%	14	28.6%	
Regional hospital	30	41.7%	19	44.2%	60	38.5%	13	26.5%	
Local hospital	27	37.5%	21	48.8%	73	46.8%	22	44.9%	
Surgery									0.020
Without	67	93.1%	41	95.3%	140	89.7%	38	77.6%	
With	5	6.9%	2	4.7%	16	10.3%	11	22.4%	
Mortality	21	6.6%	17	5.3%	43	13.4%	20	6.3%	0.208
Charlson Comorbidity Index (CCI)	1.19	± 1.12	1.23	± 0.95	1.28	± 1.31	1.00	± 1.06	0.568
Length of days	353.6	± 607.2	209.1	± 269.5	186.4	± 261.7	328.6	± 510.3	0.014
Medical cost (US\$)	24,102.4	± 27,824.7	18,546.5	± 20,207.7	16,257.1	± 20,739.6	24,852.8	± 30,347.3	0.049
Inpatients times	11.7	± 14.1	9.8	± 12.3	7.8	± 7.5	12.3	± 14.1	0.024

were hospitalized not only for BPSD treatment, but also for treatment of various diseases. The results indicated that the top five diseases leading to inpatient admissions were pneumonia (n=180/9.0%), urinary tract infection (n=127/6.4%), obstructive chronic bronchitis with acute exacerbation (n=81/4.1%), acute respiratory failure (n=64/3.2%), and unspecified septicemia (n=45/2.3%).

■ Inpatient mortality diagnosis and distribution of time of death

According to a 13-year follow up of patients with dementia who were admitted to the psychiatric department, the top three diseases leading to inpatient mortality were pneumonia (n=32/31.7%), respiratory failure (n=25/24.8%), and septicemia (n=12/11.9%). That in a 13-year follow-up, 101 patients with dementia died during psychiatric admission. More than half of these mortality cases (55.4%) occurred within 2 years, and 96% of the patients died within 6 years. The time of death showed

statistically significant differences (P=0.012). In terms of VaD and AD, the distribution of time of death also differed. Noticeably, the time of death for patients with VaD concentrated in the first three years, whereas that for patients with AD was uniformly distributed and showed no substantial difference every year. However, the time of death for patients with AD differed considerably after the sixth year, decreasing from 10.1% to 1.1% in the seventh year (Figure 2). An analysis of time of death based on the four types of symptoms showed that the mortality rate one year after admission to the psychiatric ward was the highest among dementia patients with delusional symptoms (32.6%), followed by those with delirium symptoms (17.6%). In particular, the six-year mortality rate among dementia patients with delirium symptoms and those with delusional symptoms was 100%. These results indicate that the four types of accompanying symptoms differed in terms of time of death, and that the differences were statistically significant (P=0.031) (Figure 3).

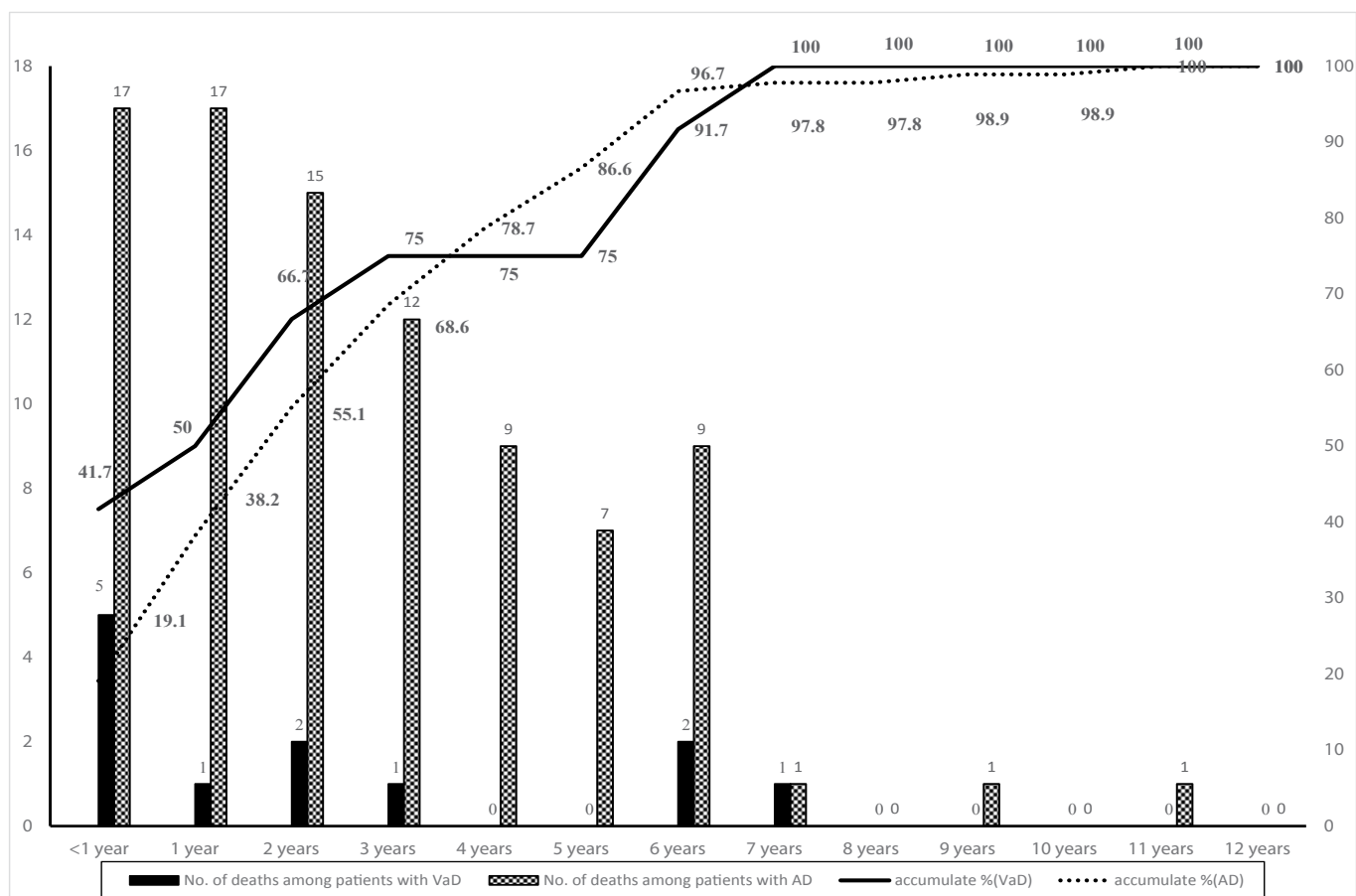


Figure 2: Distribution of Time of Death in a 13-year Follow-Up (Total and Type).

■ **Inpatient mortality risk and influencing factors**

This study used Cox regression to analyze the mortality risks and risk factors associated with patients with dementia who are admitted to psychiatric department for treatment. After the type of dementia, season, place of residence, level of care, surgery history, and CCI scores were controlled for, the results indicated that the risk factors for psychiatric admission mortality were age, gender, accompanying symptoms, and level of care. One-year increase in age is associated with 3% increase in risk of hospitalization mortality. Mortality risk for male inpatients was 2.9 times higher than that for female inpatients ($P < 0.001$). The mortality risks among inpatients with delirium and those with delusional symptoms were 2.84 HR ($P = 0.004$) and 2.17 HR ($P = 0.008$) higher than those among inpatients with uncomplicated symptoms (Table 5), respectively.

Discussion

The results of this study showed that the number

of male patients with dementia who were admitted to psychiatric ward was 2.8 HR higher than that of female patients (73.8% vs. 26.3%). In addition, medical cost, length of hospital stay, and number of times of hospitalization were higher among male patients compared with those of female patients. These results differ from previous findings, which showed that the number of female inpatients with dementia was higher than that of male inpatients [8,11,12], but are similar to the result of a previous study (ie, the number of male inpatients was higher than that of female inpatients) [30]. Extant clinical observations and literature showed that male patients with dementia were typically associated with aggressive behavior, regressive behavior, inappropriate behavior, aggression, wandering behavior, and delusions. By contrast, female patients with dementia often exhibit depressive symptoms (eg, crying, sadness, anxiety, and fear), verbal complaints, and hallucinations [31,32]. Numerous past studies have indicated that caregivers of patients with dementia reported disruptive behavior (e.g., aggressive behavior,

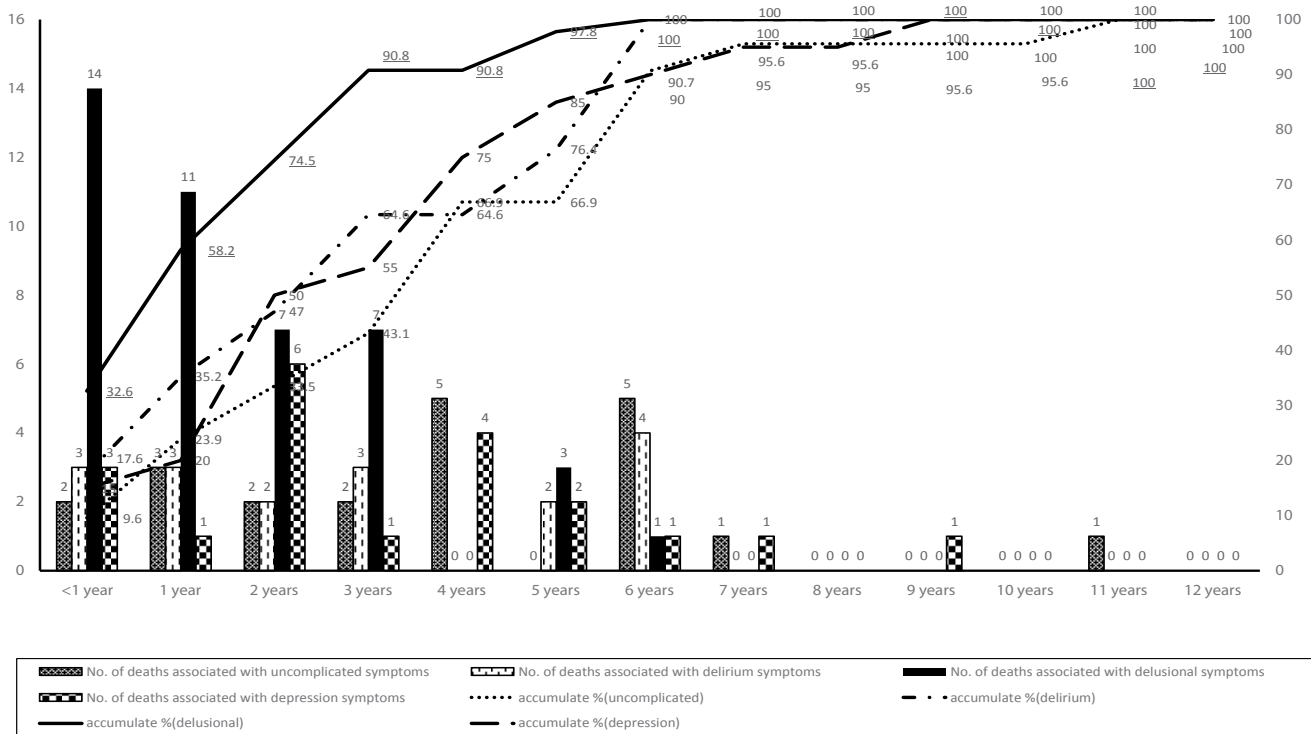


Figure 3: Distribution of Time of Death in a 13-year Follow-Up (Accompanying Symptoms).

Table 5: Cox regression model.

Variables	Adjusted HR	95% CI	95% CI	P value
Gender				<0.001
Male	2.90	1.67	5.13	
Female	Reference			
Type				
AD	1.32	0.72	2.40	0.358
VaD	Reference			
Accompanying symptoms				
delirium	2.84	1.40	5.75	0.004
delusional	2.17	1.23	3.83	0.008
depression	1.82	0.94	3.52	0.075
uncomplicated	Reference			
Season				
Summer (June-August)	1.32	0.73	2.39	0.355
Autumn (September-November)	1.33	0.72	2.46	0.365
Winter (December-February)	0.73	0.41	1.31	0.291
Spring (March-May)	Reference			
Low-income				0.147
With	0.42	0.13	1.36	
Without	Reference			
Level of care				
Hospital center	0.740	0.45	1.23	0.244
Regional hospital	0.458	0.22	0.95	0.037
Local hospital	Reference			
Surgery				0.463
With	1.27	0.67	2.43	
Without	Reference			
Age (years)	1.03	1.01	1.06	0.007

Charlson Comorbidity Index (CCI)	0.99	0.84	1.16	0.882
Length of days	1.00	1.00	1.00	0.696
Medical cost (US\$)	1.00	1.00	1.00	0.072
Inpatients times	1.00	0.99	1.01	0.943

screaming, physical assaults, and verbal abuse) to be the most difficult, stressful, and helpless situation when caring for these patients. These aggressive behavior or problematic behavior was also the reason prompting caregivers to admit these patients to psychiatric ward for treatment [11,33,34]. This phenomenon possibly explains the higher percentage of male inpatients in the present study.

Previous studies have shown that onset of AD typically occurs after the age of 65 years, and the prevalence of this disease increases with age. In addition, 7% of patients with AD were aged 65–74 years, and 53% of patients with AD were aged 75–84 years [35,36]. In the present study, the rate of BPSD among patients with AD who were admitted to psychiatric department was higher than that among patients with VaD, irrespective of average age or age group. This result is possibly attributed to the earlier onset of patients with VaD compared with patients with AD [35].

Multiple studies have reported that BPSDs among patients with VaD were mostly depressive symptoms, followed by change in dietary behavior, sleep disorder, agitation or aggressive behavior, and delusional symptoms [3,5,37–40]. However, we found that VaD is most commonly associated with uncomplicated symptoms, followed by delusional subtype. This discrepancy is probably caused by the difference in research samples and location. Previous studies generally recruit community residents [38] and patients who visit clinics [3] and hospital inpatient departments [5,39]. Our study samples were inpatients whose symptoms and disease severity differed from those of community-based patients. Moreover, AD in our study was mostly associated with delusional symptoms (53.2%). This result is similar to previous foreign and domestic studies, which reported that the percentage of delusional symptoms was the highest among patients with AD (30–75.2%) [5,38,41].

Inconsistent results have been reported on the mortality risk among patients with VaD and AD. Most of these results revealed that mortality risk among patients with VaD was higher than that among patients with AD; the research participants involved were patients

living in a community and those who visited medical clinics, and the follow-up period was 2.5–5 years [17,25,26]. In addition, several studies found that the mortality risks among VaD and patients with AD were similar, and that mortality risk was not related to dementia diagnosis but was related to disease severity. The research participants involved in these studies were inpatients, community residents, and those who visited medical clinics, and the follow-up period was 6–13 years [27,28]. The 13-year follow-up and observation conducted in our study showed that the cumulative mortality risk among patients with VaD and those with AD did not differ considerably; however, the time of death varied substantially between them. For patients with VaD, the mortality rate one year and three years after admission to the psychiatric ward was 41.7% and 75%, respectively. For patients with AD, the mortality rate one year and three years after admission to the psychiatric ward was 19.1% and 68.6%, respectively. Therefore, the discrepancy between the results of past studies comparing the mortality risk of patients with AD and those with VaD is likely related to the different follow-up periods and research participants.

This study determined that in addition to BPSDs, diagnoses most often leading to inpatient psychiatric treatment among patients with dementia were pneumonia and urinary tract infection. This result accords with the findings of previous studies regarding the most common reasons for admission treatment [16,42–44]. In addition, pneumonia was the foremost cause of death in our study, which is similar to the primary cause of deaths reported in previous studies [7,16,45–47]. Several studies have listed multiple factors associated with pneumonia-caused death, and these include infection and dysphagia [45,46]. Use of antipsychotic and benzodiazepine is also a risk factor of pneumonia and mortality [48,49]. Therefore, the risk of pneumonia-caused death is likely to increase after patients with dementia are admitted to psychiatric ward for treatment. Prevention of pneumonia in patients with dementia who are admitted to the psychiatric department is a crucial topic for health care professionals. For patients taking antipsychotic and benzodiazepine

treatments, health professionals should adopt measures for infection prevention, encourage patients to receive pneumonia and flu vaccine, and observe conditions of dysphagia in these patients, thereby preventing and reducing the incidence of infection and lowering mortality risk.

Mortality risks and factors associated with psychiatric admission of patients with dementia were male, old age, delirium symptoms, and delusional symptoms. Regarding hospitalization mortality risk, mortality risk for male inpatients was 2.9 HR higher than that for female inpatients. Previous studies have indicated that the mortality rate and mortality risk of male patients with VaD and those with AD were higher than those of female patients irrespective of the place of origin of these patients (ie, community, clinics, or inpatient departments) [17,26,28,50]. This result is similar to the results of the present study regarding patients with dementia admitted to psychiatric wards. We determined that accompanying symptoms were a predictor of hospitalization mortality risk, and that the mortality risks associated with delirium and delusional symptoms were respectively 2.84 HR and 2.17 HR higher than those associated with uncomplicated symptoms. Furthermore, the mortality rate one year after admission to the psychiatric ward was the highest among dementia patients with delusional symptoms followed by those with delirium symptoms. Older age follows higher mortality risk. One-year increase in age is associated with 3% increase in risk of hospitalization mortality, implying that age is also a predictor of hospitalization mortality risk. Multiple studies have reported that the mortality risk of patients with dementia increases with age, particularly patients with VaD and those with AD, whose mortality risk rises as their disability increases in severity with age [8,17,25,26,28,51].

Limitations

The research limitations of this study were

as follows. This study involved an analysis of NHIRD, and variables such as education level and marital status were not included in the investigation. This study adopted cross-sectional design, which allows for only an analysis of the association between different variables and not the causal relationships between them. The collected data was based on the hospitalized patients only; and therefore, no data of the patients who died elsewhere was available or analyzed.

Conclusion

The factors that influence the mortality of patients with dementia admitted to psychiatric department were male, old age, delirium symptoms, and delusional symptoms. The mortality rate of patients with VaD one year after admission to the psychiatric ward was higher than that of patients with AD. The 13-year long-term follow-up showed that pneumonia is the most common disease leading to mortality.

For patients with dementia who are admitted to psychiatric department, particularly those with VaD, those with delusional symptoms, those with delirium symptoms, and families of these patients, efforts should be made to prevent respiratory infection, reduce hospitalization mortality rate, and provide BPSD treatments and relevant health education. Future studies could investigate the risks and factors associated with antipsychotic- and pneumonia-caused deaths among patients with dementia who are admitted to a psychiatric department.

Ethical Approval

Joint Institutional Review Board of Tri-Service General Hospital (TSGHIRB No.2-106-05-029).

Conflict of Interest

The authors declare that they have no competing interests.

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