Research paper

Suicide death rates in patients with cardiovascular diseases – A 15-year nationwide cohort study in Taiwan

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ABSTRACT

Background: The literature on suicide mortality rates in patients with cardiovascular diseases (CVDs) is limited.
Methods: Taiwan National Health Insurance Research Database and Taiwan Death Registry were retrieved for patients with the 5 CVDs: congestive heart failure (CHF), acute myocardial infarction (AMI), ischemic stroke (IS), hemorrhagic stroke (HS), and pacemaker implantation (PMI) between January 1, 2001, and December 31, 2015. We excluded patients younger than 15 years old. The primary outcome was suicidal death. The standardized mortality ratio (SMR) was used to compare the risk of suicidal death in the 5 CVDs to the general population.
Results: From 2001 to 2015, there were 212,206 patients with CHF, 178,894 patients with AMI, 475,359 patients with IS, 189,555 patients with HS, and 64,173 patients with PMI. The SMR per 100,000 person-year, 95% CI was 59.6 (54.5–64.8) for those with CHF, 44.6 (40.1–49.1) for AMI, 57.6 (54.7–60.5) for IS, 44.6 (40.2–49.0) for HS, 54.0 (45.9–62.0) for PMI, and 20.3 (20.1–20.4) for the general population. Patients with CHF patients had the highest SMR (2.10), followed by IS (1.96), PMI (1.86), HS (1.65), and AMI (1.46). The SMRs for patients with CVDs peaked at year 2 after the diagnosis, declined for patients with AMI, IS, and HS, increased and decreased for PMI alternately, and reached very similar values all five CVDs after 10th year after the diagnosis.
Conclusions: Patients with acute CVD with AMI, IS, and HS had suicide death rates peaked early after diagnosis, but patients with chronic CVD with CHF and PMI had suicide death rates that increased progressively. In addition, patients with PMI, CHF, IS had highest association with psychiatric illness and patients with PMI who were of young to middle age had highest suicide death rate.

1. Introduction

Major physical health conditions were associated with increased risks of depression and suicide (Ahmedani et al., 2017). A prospective study noted that 13% of men and 17% of women had an affective disorder in general medical admissions (Mayou et al., 1991). Of patients admitted for chronic medical conditions such as diabetes mellitus and cancer, 20–30% developed an affective disorder, while in admissions for acute medical or surgical conditions (Guthrie, 1996; McDaniel et al., 1995), up to 58.6% of the patients received a diagnosis of affective disorders on discharge (Gerson et al., 2004). Protracted illness

and depression predispose the patient to lose the desire to live and precipitate suicide, affecting the young and the old alike (Shah et al., 2011; Juurlink et al., 2004).

In cardiovascular diseases (CVDs), a number of diseases have been studied for their association with suicide risks. In a study on patients with acute myocardial infarction (AMI), post-myocardial infarction depression is common but remains insufficiently recognized and treated (Larsen, 2013). The risk of suicide was particularly high after the diagnosis of AMI and remained high 5 years after diagnosis (Lossnitzer et al., 2009). In another study, 17% of the patients with congestive heart failure (CHF) who were followed up at the outpatient

Table 1
Baseline clinical characteristics.

	Congestive heart failure (n = 212,206)		Acute myocardial infarction (n = 178,894)		Ischemic stroke (n = 475,359)		Hemorrhagic stroke (n = 189,555)		Pacemaker (n = 64,173)	
	n	%	n	%	n	%	n	%	n	%
Clinical variables										
Age										
15–49	15,208	7.17	24,795	13.86	37,195	7.82	38,106	20.10	3078	4.80
50–64	36,229	17.07	54,665	30.56	126,592	26.63	59,973	31.64	9675	15.08
65–79	84,290	39.72	64,575	36.10	209,199	44.01	61,622	32.51	29,875	46.55
≥ 80	76,479	36.04	34,859	19.49	102,373	21.54	29,854	15.75	21,545	33.57
Gender										
Female	104,572	49.28	50,735	28.36	195,370	41.10	72,917	38.47	31,585	49.22
Male	107,634	50.72	128,159	71.64	279,989	58.90	116,638	61.53	32,588	50.78
Comorbidities										
Hypertension	171,799	80.96	127,465	71.25	362,422	76.24	131,288	69.26	51,205	79.79
Hyperlipidemia	85,730	40.40	95,195	53.21	211,318	44.45	47,471	25.04	28,925	45.07
Diabetes mellitus	99,873	47.06	78,243	43.74	196,552	41.35	50,481	26.63	25,876	40.32
Coronary artery disease	25,531	12.03	12,272	6.86	26,114	5.49	6246	3.30	7167	11.17
Carotid artery disease	20	0.01	8	0.00	47	0.01	12	0.01	3	0.00
Peripheral artery disease	28,992	13.66	18,843	10.53	45,325	9.53	12,071	6.37	8332	12.98
Venous thromboembolism	6626	3.12	2958	1.65	6583	1.38	2775	1.46	1755	2.73
Atrial fibrillation/atrial flutter	60,781	28.64	16,201	9.06	59,087	12.43	9607	5.07	20,713	32.28
Chronic pulmonary obstructive disease	87,000	41.00	45,482	25.42	112,488	23.66	33,422	17.63	21,411	33.36
Chronic kidney disease	75,344	35.51	43,795	24.48	76,113	16.01	27,365	14.44	19,104	29.77
Liver cirrhosis	9351	4.41	3962	2.21	12,211	2.57	9125	4.81	2613	4.07
Malignancy	14,152	6.67	8862	4.95	26,747	5.63	9980	5.26	5017	7.82
Charlson Comorbidity Index										
0	17,056	8.04	6080	3.40	3233	0.68	9590	5.06	3191	4.97
1	19,683	9.28	25,131	14.05	60,204	12.66	41,851	22.08	6258	9.75
2–3	69,250	32.63	57,793	32.31	171,013	35.98	68,458	36.12	18,533	28.88
4–5	59,875	28.22	44,615	24.94	140,998	29.66	42,549	22.45	18,007	28.06
≥ 6	46,342	21.84	45,275	25.31	99,911	21.02	27,107	14.3	18,184	28.34
Outpatient visit										
0	604	0.28	1134	0.63	2988	0.63	2823	1.49	51	0.08
1–5	1661	0.78	2674	1.49	7153	1.50	5492	2.90	181	0.28
≥ 6	209,941	98.93	175,086	97.87	465,218	97.87	181,240	95.61	63,941	99.64
Hospital admission										
0	29,817	14.05	57,974	32.41	151,382	31.85	69,320	36.57	10,658	16.61
1–5	119,901	56.50	91,111	50.93	262,600	55.24	96,934	51.14	37,943	59.13
≥ 6	62,488	29.45	29,809	16.66	61,377	12.91	23,301	12.29	15,572	24.27
Emergency visit										
0	77,998	36.76	76,530	42.78	223,695	47.06	96,032	50.66	22,589	35.20
1–5	97,312	45.86	81,083	45.32	211,590	44.51	78,179	41.24	30,783	47.97
≥ 6	36,896	17.39	21,281	11.9	40,074	8.43	15,344	8.09	10,801	16.83
Substance abuse	4283	2.02	5269	3.24	12,328	2.59	6612	3.49	1081	1.68
Psychiatric illness										
Mood disorder	19,384	9.13	12,774	7.14	38,278	8.05	13,246	6.99	6701	10.44
Anxiety disorder	56,519	26.63	38,088	21.29	106,451	22.39	33,746	17.80	20,549	32.02
Psychotic disorder	4563	2.15	2533	1.42	8510	1.79	3657	1.93	883	1.38
Depressive disorder	7095	3.34	4310	2.41	14,707	3.09	4927	2.60	2251	3.51

department were reported to have increased incidence of depression leading to suicidal ideation and self-harm (Hong et al., 2017). In the study of suicide rates in patients who had stroke, the standardized mortality ratio (SMR) was 2.14 in these patients compared to a general population (Bordier and Robert, 2004). There have been just a few reports on patients with pacemaker implantation (Placido and Sposito, 2009).

Since there are no studies on the comparative suicide risks among frequently encountered CVDs and past studies showed inconsistent results of CVD with suicide (Larsen, 2013; Lossnitzer et al., 2009; Hong et al., 2017; Bordier and Robert, 2004; Placido and Sposito, 2009), we aimed to estimate the rates of suicidal death in CHF, AMI, IS, HS, and PMI and compare them with those in the general population using standardized mortality ratio (SMR).

2. Methods

2.1. Data source

The primary data sources used in this study include Taiwan National Health Insurance Research Database (NHIRD) and Taiwan Death Registry (TDR). The NHIRD includes information about inpatient and outpatient services, diagnoses, prescriptions, examinations, operations, and expenditures for the beneficiaries of Taiwan's National Health Institute (NHI). The NHI Program started in 1995 and covers 99.6% of the 23 million residents in Taiwan (National Health Insurance Administration). The TDR includes information about the date of death, cause of death (underlying and immediate) for deceased Taiwanese residents. The accuracy of cause-of-death coding in Taiwan has been validated previously (Lu et al., 2000). The Institutional Review Board of Chang Gung Memorial Hospital approved this study (IRB No. 201701231B0). Informed consent was waived because the original ID in the NHIRD and in the TDR were de-identified before the data was released to researchers.