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Suicide deaths among patients with end-stage renal disease receiving dialysis: A population-based retrospective cohort study of 64,000 patients in Taiwan

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ABSTRACT

Background: Patients with end-stage renal disease (ESRD) who receive dialysis may experience increased distress and risk of suicide.
Methods: This population-based retrospective cohort study linked Taiwan's national register of ESRD patients on dialysis and the cause-of-death mortality data file. A separate multiple-cause-of-death data file was used to investigate the detailed suicide methods used. Standardized mortality ratios (SMRs) were calculated for the overall patient group and by sex, age, year of initiating dialysis, method of suicide, and time since initiation of dialysis.
Results: Among 63,854 ESRD patients on dialysis, 133 died by suicide in Taiwan in 2006–2012; the suicide rate was 76.3 per 100,000 patient-years. The SMR for suicide was 2.38 (95% confidence interval [CI] 1.99–2.82) in this patient group. Suicide risk was highest in the first year of dialysis (SMR = 3.15, 95% CI 2.39–4.08). The risk of suicide by cutting was nearly 20 times (SMR = 19.91, 95% CI 12.88–29.39) that of the general population. Detailed information on death certificates indicated that three quarters of patients who killed themselves by cutting cut vascular accesses used for hemodialysis.
Limitations: Information on risk factors such as socioeconomic position and mental disorders was unavailable.
Conclusion: In a country where the national health insurance program covers most expenses associated with dialysis treatment, the suicide risk in ESRD patients on dialysis still increased nearly 140%. Adequate support for ESRD patients initiating dialysis and the assessment of risk of cutting vascular access as a potential means of suicide could be important strategies for suicide prevention.

1. Introduction

For the majority of patients with end-stage renal disease (ESRD), dialysis therapy is necessary to maintain their lives before undergoing transplantation. A number of factors may contribute to distress and poor mental health in ESRD patients receiving dialysis - loss of freedom and disruption of family and social life (Hagren et al., 2001), the awareness of physical vulnerability and psychological dependence on the dialysis (Hagren et al., 2001; Richard and Engebretson, 2010), feelings of stigma and rejection (Richard and Engebretson, 2010), and depression that is underdiagnosed and undertreated (Fukuhara et al., 2006). Although these factors may in turn contribute to suicide risk, there were only few previous studies of suicide risk in dialysis patients. A US study showed that there were 24.2 suicides per 100,000 in dialysis patients, corresponding to an 84% increase in suicide risk compared to the general population; one fourth of suicides occurred within the first 3 months after beginning dialysis, while half occurred within the first year (Kurella et al., 2005). Another study of dialysis patients in Japan

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reported a standardized mortality ratio (SMR) of 2.9, i.e. a nearly three-fold increase in suicide risk (Wakasugi et al., 2013).

The vascular access required for hemodialysis may cause massive bleeding if injured and may be a risk factor for suicide. A few forensic case reports showed that some dialysis patients died by exsanguinations (Charlot and deRoux, 2009; Edirisinghe and Busuttil, 2006). However, no large scale studies have investigated the characteristics of methods used for suicide in dialysis patients, although such information may inform suicide prevention as restricting access to means is among prevention strategies with the strongest evidence base (Yip et al., 2012).

The prevalence of ESRD in Taiwan was reported to be the highest in the world (2584 per million population); 90% of ESRD patients in Taiwan received hemodialysis, while 10% were treated with peritoneal dialysis (Collins et al., 2012). In Taiwan, patients receiving dialysis are exempt from most medical expenses under the National Health Insurance program. Protected by relatively sufficient financial support for medical care and access to dialysis, however, it is unclear whether ESRD patients receiving dialysis in Taiwan still experience increased suicide risk.

In this study we investigated suicide risk in dialysis patients compared to the general population in Taiwan. We also examined characteristics such as age, sex, suicide method, and the period after the initiation of dialysis in relation to suicide risk among these patients.

2. Methods

In this population-based retrospective cohort study we linked two of Taiwan's national registry databases: The National Registry of Patients with Catastrophic Illness (NRPCI) and the National Cause-of-Death Register (TNCDR) (Supplemental Fig. 1a). Patients were identified based on International Classification of Diseases, 9th Revision (ICD-9) codes 585, 403, and 404, from the NRPCI to which any Taiwanese who had ESRD and initiated dialysis therapy were registered. The NRPCI is part of the Taiwan's National Health Insurance (NHI) program and includes all patients with major chronic debilitating diseases such as cancer, severe mental illness, autoimmune diseases, cirrhosis, organ transplants, respiratory failure that requires ventilator support, and ESRD receiving dialysis. The NHI program is a single-payer insurance program run by Taiwan's Ministry of Health and Welfare since 1995 (Chiang, 1997; National Health Insurance Administration Ministry of Health and Welfare, 2017). It is mandatory for all Taiwanese citizens and contracts with more than 95% of health care providers in Taiwan. Patients with various chronic debilitating diseases, including those with ESRD receiving renal replacement therapy (hemodialysis or peritoneal dialysis), are enrolled in the NRPCI and exempt from copayments for illness-related medical care within the NHI. Information about sex, age, and the date of initiating dialysis for ESRD patients was extracted from the NRPCI.

All dialysis patients were identified based on the NRPCI during the period 2006–2011 and followed up to the day of death as ascertained by linkage to the TNCDR, or until the end of the study period, i.e. December 31, 2012; thus every patient was followed for at least one year. Suicide deaths were identified using ICD-9 codes E950-E958 (2006–2008) or ICD-10 codes X60-X84 (2009–2011). We also included deaths that were likely to be misclassified suicides, including deaths of undetermined intent (ICD-9 codes: E980-E988; ICD-10 codes: Y10-Y34), accidental pesticide poisoning (ICD-9 codes: E863; ICD-10 codes: X48), and accidental suffocation (ICD-9 codes: E913; ICD-10 codes: W75, W76, W83, W84) (Chang et al., 2010). Suicide methods were classified into eight categories: solid or liquid substances poisoning, other gases and vapors poisoning (mainly by carbon monoxide poisoning from burning barbecue charcoal) (Chang et al., 2014), hanging, drowning or submersion, firearms, cutting, jumping, and other methods (Supplemental Table 1).

To investigate the details of suicide methods used by ESRD patients, the original diagnoses in text recorded on the death certificates were extracted from a national multiple-cause-of-death data file (Supplemental Fig. 1b) (Lu and Lin, 2010). This file is separate from the TNCDR and thus could not be linked to the NRPCI dataset. ESRD patients were identified using the ICD-10 code N18 (chronic kidney disease) or when the word “dialysis” appeared anywhere in the diagnoses recorded on the death certificate.

Suicide rate in dialysis patients was calculated by dividing the number of suicides by patient-years observed over the study period. The SMR was calculated by dividing the observed number of suicide in the dialysis patient cohort by the expected number of suicide, which was calculated by summing up age-specific expected numbers of suicide across the following age bands – 0–14, ≥ 85, and five-year categories from age 15 to 84 years (Boyle and Parkin, 1991). SMR for suicide was also calculated by sex, age at registration with the NRPCI, year of initiating dialysis, method of suicide, and time (months) since initiation of dialysis (0–3, 0–6, 0–12, 13–24, 25–36, 37–48, 49 and above). Statistical analyses were conducted using the SAS 9.12 program (SAS Institute Inc., Cary, NC, USA). Ethical approval for the study was obtained from the Research Ethic Committee of National Taiwan University Hospital (REC201204034RIC).

3. Results

A total of 63,854 ESRD patients receiving dialysis were identified (Table 1). The mean age at registration was 64.34 (standard deviation = 14.51) years. Approximately half of the patients were male (51.87%), and the incidence of dialysis was similar in each of the two-year periods (2006-7, 2008-9, and 2010-11). Among 26,253 deaths occurring during the study period, 133 (0.5%) were suicides or possible suicides - 110 (0.42%) were certified as suicides and 23 (0.09%) as undetermined intent; none was certified as accidental pesticide poisoning or accidental suffocation. The suicide rate (suicides and possible suicides combined) was 76.3 per 100,000 patient-years, or 63.1 per 100,000 based on certified suicides only.

The overall SMR for suicide was 2.38 (95% Confidence Interval [CI] 1.99–2.82) in ESRD patients on dialysis (Table 2). The SMR was similar in men (2.41, 1.94–2.96) and women (2.32, 1.67–3.14), and was highest among patients aged 45–64 (3.61, 2.84–4.53), followed by patients younger than 45 years (2.73, 1.45–4.66) and those aged 65 or older (1.48, 1.09–1.99). The SMRs were similar in the three two-year

Table 1
Characteristics of registered patients with end-stage renal disease receiving dialysis in Taiwan, 2006–2011 (N = 63,854).

Variables	Number (%) or mean (SD)
Age at registry (years)	64.34 (14.51)
Sex (n)	
Male	33,124 (51.87)
Female	30,730 (48.13)
Person-years, total	174363.15
Number by year of initiating dialysis (n)	
2006–2007	20,333 (31.84)
2008–2009	21,429 (33.56)
2010–2011	22,092 (34.60)
Number of death (n)	
Suicide and undetermined intent	133 (0.51)
Suicide	110 (0.42)
Undetermined intent	23 (0.09)
Causes other than suicide or undetermined intent	26,084 (99.49)
Interval between registry and suicide (month)	
Mean	19.87 (17.91)
Median (interquartile range)	15 (5–32)
Interval between registry and death from causes other than suicide/undetermined intent (month)	
Mean	19.06 (18.63)
Median (interquartile range)	13 (3–30)

SD = standard deviation.