

Hip Fracture Trends in Japanese Dialysis Patients, 2008-2013



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Background: Contrary to observations of decreasing rates in Western nations for the past 2 decades, age-adjusted rates of hip fracture in the general population in Japan have continually increased. This study aimed to analyze recent changes in trends of hip fracture incidence among Japanese dialysis patients between 2008 and 2013.

Study Design, Setting, & Participants: Using data from the Japanese Society for Dialysis Therapy Renal Data Registry database from 2007 to 2013, we created a point-prevalent study cohort for each study year. Prevalent dialysis cohorts included patients 20 years or older without a history of hip fracture who were receiving maintenance dialysis in Japan on December 31 of each year.

Factors: Age, sex, and calendar year.

Outcomes: Hip fracture incidence rates.

Measurements: Unadjusted hip fracture rates were estimated using number of events per 1,000 patient-years in each year and then standardized for age to the 2013 dialysis population. Average annual percentage of change in rates and

corresponding 95% CI were computed for trend by joinpoint regression analysis.

Results: During the study period, 6,615 and 4,963 hip fractures were recorded among female and male dialysis patients, respectively. Age-standardized hip fracture rates decreased steadily from 2008 (21.1/1,000 patient-years) to 2013 (17.7/1,000 patient-years) among women, but remained constant from 2008 (8.6/1,000 patient-years) through 2013 (8.2/1,000 patient-years) among men. Decreases in the joinpoint trend for hip fracture were significant among female (−3.6% [95% CI, −6.9 to −0.2] per year), but not among male, dialysis patients (−1.4% [95% CI, −5.7 to 3.0] per year) from 2008 through 2013.

Limitations: Only the first hip fracture event was considered in calculations of fracture rates.

Conclusions: In contrast to the increasing incidence of hip fracture in the general Japanese population, we found that the incidence of hip fracture in Japanese dialysis patients between 2008 and 2013 decreased among women, but did not change in men.

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Am J Kidney Dis. 71(2): 173-181. Published online November 20, 2017.

doi: 10.1053/j.ajkd.2017.07.017

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Dialysis patients face definitively higher risks for hip fracture compared to the general population.¹⁻³ Data from the US Renal Data System have revealed that the overall age-adjusted incidence for hip fracture among white dialysis patients is 4 times greater than that in the

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general white population.¹ Data from the Japanese Society for Dialysis Therapy (JSDT) registry have also shown that the overall age-adjusted incidence for hip fracture for Japanese hemodialysis patients is 5 times greater than that in the general Japanese population.² Furthermore, data from the Dialysis Outcomes and Practice Patterns Study (DOPPS) have indicated that within each DOPPS country, the country-specific rate for hip fractures requiring hospitalization in the dialysis population is higher than reported rates for hip fracture in the general population.³ Thus, the burden of hip fracture is a critical and common problem in many dialysis populations throughout the world.

Recent studies from the United States determined that although hip fracture rates had been increasing since the 1990s, they began to decline since about 2005, in both incident dialysis patients⁴ and prevalent hemodialysis

patients.⁵ These trends differ from those observed in the general non-end-stage renal disease (ESRD) population, which show a small steady decrease starting in the late 1990s. These findings suggest that the improved trend since about 2005 is due to factors unique to dialysis patients. However, it is unclear whether incidence rates for hip fracture in dialysis populations have declined outside the United States. If trends in hip fracture rates have also improved in dialysis populations in other countries, improved trends in dialysis patients may be due to factors specific to dialysis patients.

Given this background, we aimed to examine changes in hip fracture incidence rates in dialysis patients at the national level to define recent trends from 2008 to 2013 in Japan. Contrary to general populations in Western nations, the general population in Japan has shown continual increases in age-adjusted rates of hip fracture,⁶ so decreases or no changes in these rates could indicate that trends in dialysis patients are due to factors specific to dialysis patients.

Methods

Data and Population

We used data from the JSDT Renal Data Registry (JRDR) from December 31, 2007, through December 31, 2013, to

identify all incident and prevalent dialysis patients with no history of hip fracture. The design and detailed methods of this questionnaire-based national survey were described previously.⁷ Briefly, the JSDT started conducting annual questionnaire surveys of dialysis facilities throughout Japan in 1968. Questionnaires are completed by staff members of each facility and sent back to the office of the Committee of the Renal Data Registry (JSDT-CRDR) to build a database and investigate national trends in dialysis care. The response rate of the surveys is >98% every year, and several studies have examined data obtained from these surveys.^{2,8-11} Since 2007, questions pertaining to the patient's history of hip fracture have been included every year. Data were obtained with the permission of the Committee of the JRDR. The standard analysis file (SAF2016006) was used for this study.

Our analyses used existing data without individual patient identifiers. The study was conducted according to the principles of the Declaration of Helsinki, Japanese privacy protection laws, and Ethical Guidelines for Medical and Health Research Involving Human Subjects published by the Ministry of Education, Science and Culture, and the Ministry of Health, Labour and Welfare in 2015. The study protocol was approved by the Medicine Ethics Committee of the JSDT. The need for informed consent was waived due to de-identified information.

Study Design

We created a point-prevalent study cohort for each study year. That is, we used 6 annual cohorts of prevalent dialysis patients who met the eligibility criteria to calculate incidence rates of hip fracture. Eligibility criteria were patients: (1) 20 years or older, because an adult is legally defined as one who is 20 years or older in Japan; (2) who were receiving maintenance dialysis in Japan on December 31 of each preceding year; and (3) who had no history of hip

fracture on December 31 of each preceding year, because our study design cannot identify new hip fracture events in patients with a history of hip fracture. Patients were eligible for multiple cohorts. Follow-up ended on the earliest date for death, withdrawal, kidney transplantation, or December 31 of each year. We excluded participants lacking information for history of hip fracture, sex, age, date of death, date of withdrawal, and date of kidney transplantation (Fig S1).

Definitions

Hip Fracture

We identified new hip fracture events by the method previously described.^{2,10} Briefly, a participant without a history of hip fracture at the beginning of the observation period was considered to have had a hip fracture if they had a history of hip fracture by the end of that period. Hip fracture incidence rates were calculated by dividing the number of hip fractures by the sum of patient-years at risk. Because exact dates of fracture incidents were not available in this study, we estimated the number of patient-years using the previously reported estimation method.^{2,10} Briefly, if a patient did not have a hip fracture, their time at risk was calculated as equal to their survival time during the 1-year study period. If a patient had a hip fracture, we assumed their time at risk as equal to half their survival time during the study period. A patient's survival time during the study period was defined as the time from the baseline of each cohort to the earliest date for death, withdrawal, kidney transplantation, or December 31 of each year. According to our previous trial calculation, application of this estimation method did not significantly affect hip fracture incidence rates.²

Other Study Variables

Age, dialysis vintage, dialysis modality, and primary cause of ESRD were defined at the baseline of each prevalent

Table 1. Baseline Characteristics of Male Dialysis Patients by Each Prevalent Cohort

Characteristic	2008	2009	2010	2011	2012	2013
Sample size	93,155	99,960	110,505	114,287	115,806	117,166
Age, y	63.4 ± 12.3	63.8 ± 12.3	64.2 ± 12.2	64.6 ± 12.2	64.6 ± 12.2	65.3 ± 12.3
Hemodialysis as dialysis modality	97.7%	97.6%	97.5%	97.4%	97.5%	97.5%
Dialysis vintage						
<1 y	12.6%	12.7%	12.4%	12.1%	12.2%	12.4%
1-<5 y	38.1%	38.0%	37.9%	37.7%	37.4%	37.3%
5-<10 y	25.0%	24.9%	25.1%	25.2%	25.2%	25.0%
10-<20 y	17.6%	17.9%	18.1%	18.3%	18.4%	18.5%
≥20 y	6.7%	6.5%	6.5%	6.7%	6.7%	6.8%
Primary cause of ESRD						
Chronic glomerulonephritis	38.4%	37.1%	35.9%	34.6%	33.2%	32.6%
Diabetic nephropathy	35.5%	36.6%	37.7%	38.6%	39.4%	40.2%
Nephrosclerosis	6.6%	7.0%	7.2%	7.7%	8.1%	8.5%
Polycystic kidney disease	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%

Note: Values for continuous variables are given as mean ± standard deviation. Age was calculated on December 31 of each preceding year, 2007 to 2012. Abbreviation: ESRD, end-stage renal disease.

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