Diagnostic Assessment & Prognosis

The risk of fall accidents for home dwellers with dementia—A register- and population-based case-control study

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Abstract

Introduction: Institutionalized people with dementia have an increased risk of fall accidents, but little is known about whether this increased risk holds for home dwellers.
Methods: This register- and population-based study comprised 115,584 cases and 394,679 controls. Cases were individuals with any fall between 2009 and 2014, and matched with up to six controls on age, sex, and geographic location. Individuals were excluded if they (1) had any fall in 2008, or (2) lived in a nursing home on the date of the fall. Dementia, other chronic diseases, and sedative medicines were assessed from Danish national registers.
Results: After adjusting for potential confounders, older people with dementia living at home had a 1.89-fold higher risk of fall (odds ratio = 1.89, 95% confidence interval [1.84–1.94], $P < .001$).
Discussion: Dementia almost doubles the risk of fall for older Danish people living at home. This highlights the need for effective fall preventions that target people with dementia.
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Keywords: Dementia; Falls; Comorbidity; Sedative medicine; Home dwellers

1. Introduction

Accidental falls and fall-related injuries are a major public health concern. It is estimated that annually more than 420,000 individuals die as a result of falling, and 37 million falls are severe enough for medical attention or treatment [1]. Falls commonly occur among people aged over 65 years, with around 30% of community-dwelling and 50% of institutionalized individuals experiencing a fall accident at least once every year [2]. Fall-related injuries in older people are associated with higher rates of disability, morbidity, and even death than in younger adults [3].

Causes for falls are multifactorial and interactional. Generally, four broad determinants are identified as causing falls, including biological, behavioral, environmental, and socioeconomic factors [4]. To some extent, certain underlying chronic diseases and intake of certain types of drugs are important contributing factors [5]. Dementia as a neurodegenerative disease can impair balance, vision, attention, and cognition, which can also cause falls [6].

The risk of falls for people with dementia has been studied in nursing homes and is associated with a two- to threefold increased risk [7–9]. However, such fall risk estimates from studies based on nursing home residents cannot be directly transferred to community-based older persons, due to the better functioning of older people living in their own homes [10].

In a systematic review of 74 studies published from 2000 to 2008 examining risk factors for falls in community-dwelling older people, dementia was not reviewed as a standalone risk factor [11]. Another review of more recently published studies only considered Alzheimer's disease but not other etiologies of dementia [12].

Recently, an Australian study of 171,278 individuals aged 65 years or older revealed that people with dementia were 58% more likely to be admitted to a hospital with a hip fracture than people without dementia [13]. However, this Australian study had an unclear setting regarding whether samples were drawn from the community alone or were mixed with institutionalized individuals. Of other studies that pointed to an association between dementia and falls in noninstitutionalized individuals, limitations are seen: among others, small sample sizes, and survey-based fall reports [14,15].

Moreover, patients with dementia are commonly diagnosed with other chronic diseases and take multiple medications [16,17]. The existence of such comorbidities and multiple medications may accelerate the severity of the disease [18] and can increase the risk for falls [19–22]. The lack of consideration for such factors in previous studies points to the need for further study.

Today, most elderly people prefer to live in their own homes as long as possible; Nordic countries promote the idea that home is the best place to grow old [23]. Moreover, 131.5 million people are projected to be living with dementia by 2050 (World Alzheimer Report 2015), many of whom will indeed be part of the population of elderly people living at home. Therefore, with access to the newest data, this study aims to evaluate dementia and risk for fall accidents among home-dwelling older people on a national population level.

2. Methods

2.1. Study design and population

In this population- and register-based nested case-control study, the source population was all residents of Denmark aged 65 years and older and alive on January 1, 2008 (n = 853,228). We retrieved each individual's data from the Danish Civil Personal Register (CPR) by using the unique personal number assigned to each person, either at birth or on immigration with Danish residency. The CPR provides each individual's information, including age, sex, address, date of birth, death, and immigration, since 1968 [24]. The CPR number can link an individual between all the national registers in Denmark. All the registers used in this study have been described in greater detail elsewhere [25].

2.2. Cases

Cases were defined as individuals in the source population with any fall accident (hereafter referred to as simply a fall) registered in the Danish National Patient Register (DNPR) in the period between January 1, 2009 and December 31, 2014 (2009–2014).

Cases were excluded if they (1) had any fall registered in the DNPR in 2008, and/or (2) resided in a nursing home at the index date of fall. We excluded those who had a fall registered in 2008 because a history of falls increases the risk of

future falls [26]. The index date for a case was the date of the first fall accident during the period of 2009–2014.

A history of falls that occurred during the period of 2008–2014 was obtained using the records of hospital emergency rooms, general practices, and other health professions in the DNPR, using International Classification of Diseases, Tenth Revision (ICD-10) codes specific to falls [27] combined with Statistics Denmark (DST) specific codes for access to fall accidents, i.e., the codes begin with four letters as EUHE. Falls in this study included falls registered both with and without injury.

The DNPR register only captures a fall if it leads to hospital admittance or emergency ward visit, that is, relatively moderate and severe falls.

2.3. Controls

For each case, up to six controls were randomly selected from the source population and matched with age, sex, and geographic location at the index date of fall.

A risk-set matching method was used, that is, any subject is eligible for sampling as a control up until they become a case, and subjects can be sampled as controls for more than one case.

Geographic location was categorized as: (1) large city, that is, Copenhagen and Frederiksberg, (2) medium size city, that is, Aarhus, Odense, Aalborg, Esbjerg, Randers and Kolding, and (3) small cities/rural area, that is, all locations not included in the large or medium size city categories.

2.4. Dementia assessment

We assessed all-type dementia, including both the primary and secondary diagnosis, from the DNPR and/or from the Danish Psychiatric Central Research Register in the period 1998–2014 [28]. The ICD-10 codes were used for dementia diagnosis extraction (ICD-10 codes: F00.0, F00.1, F00.2, F00.9, F01.0, F01.1, F01.2, F01.3, F01.8, F01.9, F02.0, F02.08, F03.9, G30.0, G30.1, G30.8, G30.9, G31.83).

To capture patients who had a clinical diagnosis but were not registered in the DNPR or Psychiatric Central Research Register, we additionally assessed the history of prescribed anti-dementia drug records in the Danish National Prescription Registry (LMDB) in the period 1998–2014 [29]. Anatomical Therapeutic Chemical Classification (ATC) codes assigned to the anti-dementia drugs that have been prescribed in Denmark were linked for extraction (ATC-codes: N06DA01, N06DA02, N06DA039, N06DA04, and N06DX01) [30].

A person was identified with dementia if that person had (1) a diagnosis of disease in the DNPR or Psychiatric Central Research Register, and/or (2) at least one anti-dementia drug registration in the LMDB. To ensure that exposure occurred before outcome, the date of dementia diagnosis or anti-dementia drug dispensed (the first redeemed prescription

date) in the registers should have occurred before the index date of fall.

2.5. Comorbidity assessment

Eight chronic diseases that commonly exist among the Danish older population were selected for the comorbidity assessment from the DNPR or the disease-specific register if available: type 2 diabetes (T2D) (ICD-10 code: E11), chronic obstructive pulmonary disease (ICD-10 codes: J40-J44), ischemic heart disease (IHD) (ICD-10 codes: I20-I25), depression (ICD-10 codes; F32-F33), hypertension (ICD-10 codes: I10, I15), stroke (ICD-10 codes: I60-I69), atrial fibrillation (ICD-10 code: I48), and asthma (ICD-10 code: J45) [31].

The identification of each of these chronic diseases was similar to the process described previously for dementia and has been described in greater detail elsewhere [25]. The presence of one or more of these eight chronic diseases was assessed both on January 1, 2009 as well as by the index date of fall and was aggregated into four categories: 0, 1, 2, or 3 or more (3+) comorbidities.

2.6. Sedative medicine

Four types of prescription medicines, including antipsychotic medicine (ATC-code: N05A), anti-anxiety medicine (ATC-code: N05B), sleeping medicine (ATC-code: N05C), and antidepressants (ATC-code: N06A), were defined as sedative medicine, and data were obtained from the LMDB. We grouped them into three categories, as 0, 1, or 2 or more (2+), in any combination.

The defined daily dose by the World Health Organization was used to identify the treatment duration of the drug [32]. One defined daily dose was assumed as one treatment day (24 hours). In Denmark, once a patient is prescribed a drug and the prescription is redeemed from a pharmacy, the LMDB registers the defined daily dose, the number of packages including the number of pills per package, and the date of redemption. We used these three indicators to identify sedative medicine users for this study as subjects who took any of these four types of medicines within 72 hours before the index date of fall.

Sedative medicines have different half-lives [33]. We chose the 72-hour interval (half-life ranged from 0 to 72 hours) to cover long-acting benzodiazepines.

2.7. Other covariates

Personal education level was grouped in the following categories according to the highest education level (in years) from the Danish Education Register [34]: low education (<10 years), medium education (10–12 years), and high education (>12 years). Marital status was extracted from the CPR and categorized as married (including partnership or cohabitation), divorced (including dissolved partnership), widowed (including partner died), and unmarried.

2.8. Statistical analyses

We used conditional logistic regression to estimate the association between dementia and falls with adjustment for education, marital status, and the number of comorbidities, with odds ratios (ORs) and 95% confidence intervals (95% CIs).

In a second analysis, we adjusted for the number of sedative medicines instead of the number of comorbidities, together with education and marital status.

Interactions between dementia and the number of comorbidities as well as sedative medicines were tested, and for each degree of comorbidities or sedative medicines, the association between dementia and risk of falls was assessed, with adjustment for education and marital status, if a significant interaction was observed.

All analyses were tested at a two-sided 5% level of significance (P value < .05). STATA, version 14 (Stata Corporation, College Station, TX) was used for all statistical analysis.

2.9. Ethical consideration

The study was approved by the Danish Data Protection Agency for the use of study data and related ethical considerations (J.no. 2016-41-4674).

3. Results

3.1. The study population characteristics

Table 1 shows the characteristics of the population assessed on January 1, 2009. In total, this study comprised 460,354 individuals, including 115,584 cases and 394,679 controls (49,909 were also cases). The median age was 80.8 (range 69.0-109.0) for the cases and 79.3 (range 69.0–108.0) for the controls.

Falls were documented more frequently among females (68.4%), those with low education (47.7%), residents of large cities (71.1%), and individuals in the age group of 80+ (52.9%).

On average, the case population had 3.4 chronic diseases (out of eight), which was slightly higher than controls, who had 3.0. A higher proportion of antidepressant, sleeping medicine, and anti-anxiety medicine use was found in cases (12.4%, 8.6%, 3.2%) than in controls (7.8%, 6.3%, 2.4%). However, more controls (7.8%) had two or more sedative medicines in comparison with the cases (6.6%).

3.2. Dementia and the risk of fall accidents

We saw a total of 394,679 individuals acting as controls at least once, of which 3.97% percent were exposed to dementia on at least one index date while having control status. We found a total of 115,584 individuals who became cases at some time, of which 7.43% were exposed to dementia on their index date. These numbers result in a crude OR of 1.94.

Table 1
Characteristics of cases and controls assessed on January 1, 2009

Population characteristics	All (n = 460,354)	Case (n = 115,584)	Control (n = 394,679)*
Sociodemographic factors			
Age, median (range)	79.4 (69.0–109.0)	80.8 (69.0–109.0)	79.3 (69.0–108.0)
Age group, n (%)			
65–69	85 (0.0)	16 (0.0)	73 (0.0)
70–74	139,232 (30.2)	28,597 (24.7)	119,475 (30.3)
75–79	115,302 (25.1)	25,820 (22.3)	98,806 (25.0)
80–84	92,988 (20.2)	23,806 (20.6)	79,716 (20.2)
≥85	112,747 (24.5)	37,345 (32.3)	96,609 (24.5)
Sex, n (%)			
Man	169,533 (36.8)	36,505 (31.6)	145,234 (36.8)
Woman	290,821 (63.2)	79,079 (68.4)	249,445 (63.2)
Civil status, n (%)			
Married/cohabiting	245,423 (53.3)	53,661 (46.4)	212,495 (53.8)
Divorced	49,416 (10.7)	13,383 (11.6)	41,472 (10.5)
Widowed	143,182 (31.1)	42,516 (37.8)	121,909 (30.9)
Never married	22,333 (4.9)	6024 (5.2)	18,803 (4.8)
Education, n (%)			
<10 years	221,181 (48.1)	55,114 (47.7)	190,460 (48.3)
10–12 years	137,319 (29.8)	32,704 (28.3)	117,636 (29.8)
>12 years	69,129 (15.0)	16,348 (14.1)	59,217 (15.0)
Geographic location, n (%)			
Large cities	340,030 (73.9)	82,131 (71.1)	291,539 (73.9)
Medium-sized towns	80,526 (17.5)	21,725 (18.8)	69,055 (17.5)
Small towns/rural	39,798 (8.7)	11,728 (10.2)	34,085 (8.6)
Chronic diseases, n (%)			
Dementia	10,019 (2.2)	4282 (3.7)	7688 (2.0)
T2D	16,218 (3.5)	4691 (4.1)	13,355 (3.4)
COPD	96,226 (20.9)	26,860 (23.4)	80,743 (20.5)
IHD	336,892 (73.2)	88,934 (76.9)	287,118 (72.8)
Depression	107,529 (23.4)	34,804 (30.1)	87,838 (20.6)
Hypertension	312,819 (68.0)	83,239 (72.0)	266,478 (67.5)
Stroke	187,959 (40.8)	53,097 (45.9)	158,408 (40.1)
AF	247,710 (53.8)	67,601 (58.5)	210,130 (53.2)
Asthma	100,310 (21.8)	27,905 (24.1)	84,279 (21.4)
Comorbidity[†] (median) (range)	3.1 (2.0) (0.0–9.0)	3.4 (1.98) (0.0–9.0)	3.0 (2.0) (0.0–9.0)
Comorbidity index[‡], n (%)			
0	80,760 (17.5)	15,483 (13.4)	71,421 (18.1)
1	23,247 (5.1)	5577 (4.8)	19,959 (5.1)
2	71,961 (15.6)	16,165 (14.0)	62,649 (15.9)
3+	284,386 (61.8)	78,359 (67.8)	240,650 (61.0)
Medicine use, n (%)			
Polypharmacy[§]	5516 (1.2)	2297 (2.0)	4271 (1.1)
Sleeping medicine	30,190 (6.6)	9979 (8.6)	24,799 (6.3)
Antipsychotic medicine	2654 (0.6)	952 (0.8)	2095 (0.5)
Anti-anxiety medicine	11,773 (2.6)	3732 (3.2)	9609 (2.4)
Antidepressants	38,905 (8.5)	14,296 (12.4)	30,736 (7.8)
Quantity of sedative medicine[¶], n (%)			
0	366,838 (79.7)	88,660 (76.7)	316,493 (80.2)
1	58,056 (12.6)	19,296 (16.7)	47,328 (12.0)
2+	35,460 (7.7)	7628 (6.6)	30,858 (7.8)

Abbreviations: AF, atrial fibrillation; COPD, chronic obstructive pulmonary disease; IHD, ischemic heart disease; T2D, type 2 diabetes.
*49,909 individuals also became cases.
[†]The sum of the chronic diseases including T2D, COPD, IHD, depression, hypertension, stroke, AF, and asthma.
[‡]Any combination of eight chronic diseases listed in b.
[§]Any use of five or more medications by a patient.
[¶]Any combination of sleeping medicine, antipsychotic medicine, anti-anxiety medicine, and antidepressants.

Conditional logistic regression adjusted for education, marital status, and the number of comorbidities showed that older people with dementia had a 1.89-fold increased risk of fall accidents compared with their matched controls (OR = 1.89, 95% CI [1.84–1.94], $P < .001$) (Table 2).

Significant interaction was observed between dementia and the number of comorbidities (interaction $P < .001$) for

Table 2
Conditional logistic regression analysis* of dementia (all-type) for the risk of fall accidents (2009–2014)

| Estimates | Fall accidents | | | |
	115,584 cases	394,679 controls[†]	OR (95% CI)	P value
Dementia (all-type)	8585	15,667	1.89 (1.84–1.94)	<.001
Marital status				
Married/cohabiting			ref	
Divorced			1.21 (1.19–1.24)	<.001
Widowed			1.13 (1.12–1.15)	<.001
Never married			1.19 (1.16–1.23)	<.001
Education				
<10 years			ref	
10–12 years			1.05 (1.03–1.06)	<.001
>12 years			1.06 (1.04–1.08)	<.001
Comorbidity[‡]				
0			ref	
1			1.26 (1.21–1.30)	<.001
2			1.13 (1.10–1.16)	<.001
3+			1.33 (1.30–1.36)	<.001

Abbreviations: 95% CI, 95% confidence intervals; OR, odds ratio.
*Adjusting for other variables listed in the table assessed on the index date of fall accident.
[†]49,909 control individuals also became cases.
[‡]Comorbidity index in this analysis was calculated based on any combination of eight chronic diseases including type 2 diabetes, chronic obstructive pulmonary disease, ischemic heart disease, depression, hypertension, stroke, atrial fibrillation, and asthma, by the index date of fall accident.

Table 3
Conditional logistic regression analysis* of dementia (all-type) for the risk of fall accidents (2009–2014)

| Estimates | Fall accidents | | | |
	115,584 cases	394,679 controls[†]	OR (95% CI)	P value
Dementia (all-type)	8585	15,667	1.91 (1.87–1.96)	<.001
Marital status				
Married/cohabiting			ref	
Divorced			1.21 (1.18–1.23)	<.001
Widowed			1.14 (1.12–1.16)	<.001
Never married			1.19 (1.15–1.22)	<.001
Education				
<10 years			ref	
10-12 years			1.05 (1.03–1.06)	<.001
>12 years			1.05 (1.03–1.06)	<.001
Sedative medicine[‡]				
0			ref	
1			1.38 (1.35–1.40)	<.001
2+			1.66 (1.63–1.69)	<.001

Abbreviations: 95% CI, 95% confidence intervals; OR, odds ratio.
*Adjusting for all other variables listed in this table assessed on the index date of fall accident.
[†]49,909 control individuals also became cases.
[‡]Sedative medicine in this analysis was based on any combination of four types of medicine including sleeping medicine, antipsychotic medicine, anti-anxiety medicine, and antidepressants, by the index date of fall accident.

risk of fall accidents. Further analysis of this interaction revealed that although the risk of falls was still significantly higher for people with dementia within each level of comorbidities compared with those without dementia, no clear upward or downward trend (ORs: 2.42, 1.90, 2.32, 1.86) was seen with an increase in the number of comorbidities (0, 1, 2, 3+).

When the number of sedative medicines replaced the number of comorbidities in the adjustment, the risk increase was similar (OR = 1.91, 95% CI [1.87–1.96], *P* < .001) (Table 3). No significant interaction between dementia and the number of sedative medicine for risk of falls was observed (interaction *P* = .064).

4. Discussion

To the best of our knowledge, this study is the first nationwide population-based study on elderly home-dwellers' risk of any registered fall accident, both with and without injury, and the relation of that risk to all-type dementia. Our data revealed that older people with dementia living at home had an almost double risk of falls.

Together with the studies conducted over the past 3 decades, a doubled or even higher risk of fall accidents among home-dwelling older people with dementia is still being identified; this may indicate that no effective initiatives targeted especially at dementia patients have been implemented on a large scale, at least not in Denmark, and this may also be the case elsewhere [12,35,36]. In this respect,

our findings therefore have implications for public health and may be of use not only to policy makers but also to health professionals and caregivers, as a reminder of the need to further implement effective fall interventions.

A number of fall prevention interventions have been implemented alongside the more than 30 years of research on dementia and home falls [37]. Some interventions, such as home-based exercise and safety interventions, have been proven to have a strong effect in preventing falls, but no evidence of a preventative effect has been shown for other interventions [38]. For those trials that have proven efficacy of intervention strategies, adoption on a larger scale (regional or national) may be hampered by political and economic obstacles.

Obstacles can also arise from other aspects specific to the disease and the population. Dementia is a cognitive disease, which may in itself cause difficulties with implementation; often, interventions targeted at these patients at home require family participation. However, acceptance of such community-based prevention programs varies and may often lead to different outcomes [39]. Increasing the public's awareness of falls and involvement in community-dwelling fall prevention can be made more efficient by not only targeting older people in general, but by specifically targeting those with dementia.

Nevertheless, our study confirmed that dementia increases fall risk in older adults living at home in Denmark, which is consistent with earlier published studies, despite differences in study designs [12,35,40]. Among these studies, an integrative review of more recently published

studies (2010–2015) investigating early dementia for the risk of falling found greater fall risk in individuals with early-stage dementia, but pooled fall risk was unable to be specified due to the review method. More importantly, none of the studies in that review were population-based and were instead relatively small studies [40]. However, another meta-analysis of six large cohort studies with a total of 137,986 participants showed strong evidence that Alzheimer's disease doubled the risk of all fractures, with a two- to five-fold increased risk of hip fracture alone [12]. Of these six studies, only a Finnish study included a community-dwelling setting and was also register- and population-based [41].

With our data set, we revealed that comorbidity interacted significantly with dementia for the risk of falls. However, no continuous upward or downward trend (ORs: 2.42, 1.90, 2.32, 1.86) was seen together with the increase in number of comorbidities (0, 1, 2, 3+). We cannot provide a meaningful explanation for this observed phenomenon, as we would have expected that either a continuously increasing or decreasing trend would have been revealed alongside the increase in the number of comorbidities. Both hypotheses seemed feasible given that both expectations are reasonable: more chronic diseases, hence an overall unhealthier individual with a higher chance of falling; or more chronic diseases, hence restricted mobility, hence a lower chance of falling. Comorbidity is more important for health-related studies nowadays. The significant interaction between dementia and comorbidity is challenging for fall prevention and management; therefore, further studies are needed.

The proportion of older people using multiple prescription drugs has increased in the past decade. Within our study population, only accounting for the selected sedative medicines, more than 5% of the total study population had an intake of three or more sedatives on January 1, 2009. Sedative medications and their combinations have been identified as risk factors for falls in earlier studies [42,43]. We also found that any intake of the sedative medicine by the index date of fall was a significant independent risk factor for falling, but no interaction between dementia and sedative medicine for fall risk was detected in our study population. An earlier review study confirmed that although psychotropic medicines doubled fall risk, the drug-dementia interaction for the increased fall risk seemed unlikely [44]. However, we are unable to capture the intake of over-the-counter medicines with this register-based data, thus such intake alone or its interaction with dementia for the risk of falls is unclear [45].

There are some notable strengths of our study. Among others, a major strength is that we studied fall risk for dementia among an entire population, and all variables were register-based information. In addition, we used an algorithm to identify dementia, i.e. clinical diagnosis combined with dementia-related medications. This algorithm can capture those individuals without a clinical diagnosis who were indeed dementia patient cases treated with dementia medication.

Furthermore, we assessed all falls registered in the DNPR, including falls registered with and without injuries. With such assessment, we believe that we have collected fall data as comprehensively as possible on a Danish national level. However, register-based records of falls most likely only record falls that require medical attention or treatment, i.e. relatively moderate and severe falls. Very minor falls are often hard to detect through such register data, given that such falls may not be reported due to the perception by the person or their caregivers of no need for any medical treatment. Even though healthcare is free of charge to everyone in Denmark, it is likely that there are additional fall cases not reported [46].

Our study has other limitations. We used data from DST to assess nursing home residency status. These data are based on an algorithm that estimates an average of nursing home residents on January 1 of each year in Denmark. A previous study found that only about half of those identified by DST were indeed residents of nursing homes in those municipalities; however, DST also missed a certain number of nursing home patients (about 10%) who were living in nursing homes [47]. Since the nursing home residents are indexed on January 1 of each year, we are uncertain how many of these individuals were indeed living in nursing homes or their own homes by the index date of their fall. But such misclassification presumably has minor impact on our overall conclusion due to the fact that the proportion of nursing home residents was relatively small (2%, data available on request) in the present study population. Further studies may consider obtaining nursing home residents' information directly from municipalities, if possible.

Due to the low validity of subtypes of dementia and lack of severity assessment [48], we only assessed dementia as all-type one. Previous studies have found that while Parkinson's disease and vascular dementia are prone to falls [49], Alzheimer's disease may be less so, at least among those who are institutionalized [50]. Because each subtype of dementia may be associated with different fall risks, pooling all types of dementia may limit the precision of our fall risk estimation. Future researchers should consider such concerns, as the diagnosis of subtypes of dementia is becoming more accurate with advances in diagnostic techniques.

5. Conclusion

This study demonstrates that dementia almost doubles the risk of fall accidents for older Danish people living at home, similar to the risk of falls for institutionalized individuals. This is a significant finding that indicates the need for further effective prevention of and interventions for falls, especially targeted to people with dementia. Further studies to evaluate clinical effectiveness and cost effectiveness of such initiatives for people with dementia are also needed in parallel.

Acknowledgments

RESEARCH IN CONTEXT

1. Systematic review: We reviewed previous epidemiological studies through PubMed. Although the risk of fall accidents for home-dwelling people with dementia has been studied, an overall study of dementia for any fall accidents on a national scale is lacking, at least in Denmark. Some studies that have investigated this association include certain limitations and are cited in this study.

2. Interpretation: In this register- and population-based case-control study comprising more than half a million Danes living at home, people with dementia had a nearly doubled risk of fall accidents. This significant finding is consistent with the findings for fall risks for institutionalized individuals currently in the PubMed database.

3. Future directions: This study highlights the need for effective fall prevention and interventions that target people with dementia, and to better guide the development of those efforts, proposes an additional study to investigate: (1) subtype of dementia for risk of fall accidents among older people living at home; and (2) interaction between dementia and comorbidity in fall accidents.

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