Falls and Depression in Men: A Population-Based Study

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Abstract

The link between falls and depression has been researched in the elderly; however, little information is available on this association in younger adults, particularly men. This study sought to investigate the link between major depressive disorder (MDD) and falls in a population-based sample of 952 men (24–97 years). MDD was diagnosed utilizing the Structured Clinical Interview for *DSM-IV-TR* Research Version, Non-Patient edition, and categorized as 12-month/past/never. Body mass index and gait were measured; falls, smoking status, psychotropic medication use, and alcohol intake were self-reported as part of the Geelong Osteoporosis Study 5-year follow-up assessment. Thirty-four (3.6%) men met criteria for 12-month MDD, and 110 (11.6%) for past MDD. Of the 952 men, 175 (18.4%) reported falling at least once during the past 12 months. Fallers were older (66 [interquartile range: 48–79] vs. 59 [45–72] years, $p = .001$) and more likely to have uneven gait ($n = 16$, 10% vs. $n = 31$, 4%, $p = .003$) than nonfallers. Participants with 12-month MDD had more than twice the odds of falling (age-adjusted odds ratio: 2.22, 95% confidence interval [1.03, 4.80]). The odds of falling were not associated with past depression ($p = .4$). Further adjustments for psychotropic drug use, gait, body mass index, smoking status, blood pressure, and alcohol did not explain these associations. Given the 2.2-fold greater likelihood of falling associated with depression was not explained by age or psychotropic drug use, further research is warranted.

Keywords

depression, falls, psychotropic medication, SCID-I/NP, osteoporosis

Background

Falls are a common occurrence that can lead to soft tissue injury, fracture, and long-term health implications. Listed among the top 10 leading global causes of years lost to disability in men (World Health Organization, 2004), falls have a negative impact on quality of life and are a major public health problem. A significant portion of injury-related deaths worldwide are caused by falls, for which males have a higher mortality rate than females (Peden, McGee, & Sharma, 2002).

Depression is a known risk factor for falls in the elderly (Deandrea et al., 2010), although the relationship appears complex. Depression has been reported to precede falls (Kallin, Lundin-Olsson, Jensen, Nyberg, & Gustafson, 2002) and falls appear to have psychological consequences, including depression, increased fear, and decreased life satisfaction (Arfken, Lach, Birge, & Miller, 1994). The use of medications that affect the central nervous system, often taken by those suffering depression, is also recognized as a risk factor for increased falls in the

elderly (Kallin et al., 2002; Quach et al., 2013; Thapa, Gideon, Fought, & Ray, 1995; Woolcott et al., 2009) and interventions that reduce the intake of psychotropic medication have been reported as effective fall prevention methods (Gillespie et al., 2009). Thus, the relationship between depression and falls could be mediated by the use of these medications.

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Falls and depression have been extensively researched in the elderly (Bloch et al., 2011; Kvelde et al., 2013; Quach et al., 2013); however, little research is available on the relationship between falls, depression, and the use of psychotropic medication in younger adults. A study of psychiatric inpatients aged 13 to 82 years reported fallers were more likely to take multiple medications and, in particular, the benzodiazepine clonazepam, compared with age and psychiatric diagnosis-matched nonfallers (Estrin, Goetz, Hellerstein, Bennett-Staub, & Seiramarco, 2009). Another study reported that the use of multiple medications, but not psychotropic medication alone, increased the risk of falling in a sample of adults aged 25 to 60 years (Kool, Ameratunga, & Robinson, 2012). Psychotropic drug use was confirmed as an independent risk factor for falls in an Australian population-based study of women aged 20 to 93 years (Williams et al., 2015). Williams et al. (2015) also reported a 2.7-fold greater likelihood of falling associated with depression, independent of recognized confounders. These relationships appear to be unexplored among population-based men spanning the adult age range.

Thus, the current study will investigate the link between major depressive disorder (MDD), psychotropic medication, and falls in a population-based random sample of 952 men spanning the adult age range.

Method

Participants

Participants were enrolled in the Geelong Osteoporosis Study (GOS), an age-stratified population-based study, designed to investigate the epidemiology of osteoporosis and fracture in Australia. GOS participants were randomly selected from the Commonwealth of Australia electoral rolls. Voting and registration with the electoral roll is compulsory for Australians aged 18+ years (Pasco, Nicholson, & Kotowicz, 2012). At the time of recruitment, participants were aged between 20 and 97 years ($n = 1,540$), and resided in the Barwon Statistical Division (Southeastern Australia). Five years later, 141 (9.2%) had died, 41 (2.7%) had left the study region, 16 (1.0%) were unable to provide written informed consent, and 139 (9.0%) were not contactable, leaving 1,203 eligible men. A total of 978 men (81% retention rate among eligible participants) attended the study center for the 5-year follow-up visit while 225 declined participation (18.7%). Of the 978 men who attended the 5-year follow-up, 17 participants did not undergo psychiatric assessment and 9 did not provide complete data on falls and were excluded from the analyses, resulting in a final sample of 952 men, aged 24 to 97 years. This study was approved by the Barwon Health Human Research Ethics Committee and

written informed consent was obtained from all participants. A full description of the GOS assessment has been published elsewhere (Pasco et al., 2012).

Assessments

GOS participants attended the study center for the 5-year assessment where clinical measures and a series of questionnaires were completed. Fall status was determined by the occurrence of one or more self-reported falls in the 12-month period prior to GOS assessment. A fall was defined as “when you suddenly find yourself on the ground, without intending to get there, after you were in either a lying, sitting or standing position” (Cwikel, Fried, Biderman, & Galinsky, 1998, p. 163). MDD was diagnosed using the Structured Clinical Interview for *DSM-IV-TR* Research Version, Non-Patient edition (First, Spitzer, Gibbon, & Williams, 2002). All psychiatric interviews were performed by trained personnel with qualifications in psychology. Participants were categorized into groups: no history of depression (never), suffered depression in the past (past MDD), or suffered depression during the 12 months prior to assessment (12-month MDD).

Height was measured to the nearest 0.1 cm using a wall-mounted stadiometer and body weight was measured to the nearest 0.1 kg using electronic scales. Body mass index (BMI; kg/m^2) was calculated from these measurements. Blood pressure was measured with a digital meter (A&D Company, model UA-751). Health status was determined from the question “In general, would you say your health is: excellent, very good, good, fair or poor?” Excellent, very good, and good health were grouped together as good health. Medication use was considered current if the participants self-reported use at the time of assessment. Alcohol consumption (average grams consumed daily) was determined by a validated questionnaire designed to document dietary intake, including alcoholic beverages, over a 12-month period. The Dietary Questionnaire for Epidemiological Studies, Version 2 assesses the intake of six types of alcoholic beverages with 10 frequency response options ranging from “never” to “every day” (Giles & Ireland, 1996). Tobacco smoking was documented and grouped as current or not. Trained research staff identified participants with uneven gait if they were shuffling, unsteady, or walking unevenly or with a wide base while completing a 5-meter timed walk.

Statistical Analysis

Characteristics of those classified as fallers and nonfallers were compared using chi-square analyses and Kruskal-Wallis. Age-adjusted binary logistic regression was performed to evaluate the relationship between falls

Figure 1. Distribution of fallers according to 10-year age groups.

and MDD status (past/12-month vs. never). Models were adjusted for psychotropic drug use, gait, BMI, blood pressure, health status, alcohol consumption, and smoking status, and interactions between exposure variables were examined. Age-adjusted binary logistic regression was also used to investigate the relationship between falls and psychotropic medication use by category (sedatives/hypnotics, antianxiety agents, antipsychotic agent, antidepressants, anticonvulsants, and multiple categories—yes/no). Values of $p < .05$ were considered significant (including interaction terms). Statistical analyses were performed using Minitab (Version 16; Minitab, State College, PA).

Results

A total of 175 (18.4%) men reported falling at least once during the 12-month period prior to assessment; see Figure 1, for distribution of fallers across 10-year age groups. Characteristics for men classified as fallers and nonfallers are reported in Table 1. Fallers were older (66 [interquartile range: 48-79] vs. 59 [45-72] years, $p = .001$) and more likely to have uneven gait ($n = 16$, 10% vs. $n = 31$, 4%, $p = .003$); otherwise the groups were similar.

The odds of falling were not associated with either psychotropic medication use, individual categories of psychotropic medication, or use of multiple psychotropic medication types ($p > .05$).

A total of 144 (15.1%) men met criteria for depression; 34 (3.6%) men suffered depression during the 12 months prior to assessment (12-month MDD), and 110 (11.6%) had suffered depression in the past (past MDD). Following adjustment for age, participants with 12-month MDD had a 2.2-fold increased likelihood of falling during the same period (age-adjusted odds ratio: 2.22, 95% confidence interval [1.03, 4.80], $p = .04$). Further adjustments for psychotropic drug use, use of multiple psychotropic medication types, health status, gait, BMI, smoking status, blood pressure, and

alcohol did not explain this association. There was no interaction between age and MDD ($p > .05$). The odds of falling were not increased among men with past MDD ($p = .41$).

Discussion

Within this population-based male cohort, 12-month depression was associated with a 2.2-fold increased risk of falling, independent of age, BMI, gait, lifestyle factors, blood pressure, and medication use. These data are consistent with previous findings using the GOS female cohort, where 12-month depression, but not past depression was associated with increased odds of falling (Williams et al., 2015).

These results are similar to those observed in elderly samples; a multivariate analysis of 17 studies investigating the association between depression and falls reported that older men and women (80% aged older than 65 years) with depressive symptoms were at 1.6-fold increased risk of falling (Deandrea et al., 2010). Falls research is largely directed toward the elderly population; yet both depression and falls can occur at any age. Talbot, Musiol, Witham, and Metter (2005) investigated falls circumstances in young, middle-aged, and older adults (65+ years). As expected, number of falls in this study increased with age. Interestingly, they reported a higher prevalence of depressive symptoms, as measured by a self-report scale, in the young and older adult fallers but not the middle-aged adult fallers. As there was no interaction between age and depression measured using a structured clinical interview in this analysis, it is suggested this relationship exists across the full adult age range in men.

A meta-analysis of 22 studies performed by Woolcott et al. (2009) reported that the use of sedatives and hypnotics, antipsychotics, benzodiazepines, and antidepressants was associated with 1.5-fold or greater increased odds of falls in individuals aged older than 60 years. Kool et al. (2012) investigated falls risk and medication use in a sample of adults aged 25 to 60 years and reported the use of multiple medications, but not psychotropic medication alone, increased the risk of falling. While the small numbers of psychotropic medication users among this sample of men should be noted, neither the use of psychotropic medications, multiple psychotropic medication categories, nor individual categories of psychotropic medication were associated with falling.

Findings of the current study need to be interpreted while keeping the following limitations in mind. There were a small number of fallers among the study participants, which could be explained by a healthy participant bias—participants were required to attend a study visit, which may have unwittingly excluded frail men. In addition, the self-reported nature of falls ascertainment in this study, requiring recall of falls over a 12-month period, may

Table 1. Characteristics for Fallers and Nonfallers.

	Fallers, N = 175	Nonfallers, N = 777	p Value
Age (years)	66 (48-79)	59 (45-72)	.001
BMI (kg/m ²)	27 (25-29)	27 (25-30)	.815
Health status—good	160 (91.4%)	693 (89.4%)	.428
Current smoker	22 (12.6%)	85 (11.0%)	.548
Alcohol intake (grams per day)	11.7 (0.8-28.2)	12.9 (2.3-29.9)	.344
Blood pressure			
Diastolic	81 (74-88)	83 (76-90)	.091
Systolic	141 (128-156)	138 (128-150)	.068
Uneven gait	16 (10.0%)	31 (4.2%)	.003
Any psychotropic medication use	25 (14.3%)	75 (9.7%)	.071
Sedatives, hypnotics	2 (1.1%)	8 (1.0%)	.894
Antianxiety agents	4 (2.3%)	15 (1.9%)	.761
Antipsychotic agents	0 (0%)	8 (1.0%)	.178
Antidepressants	15 (8.6%)	50 (6.4%)	.311
Anticonvulsants	6 (3.4%)	11 (1.4%)	.069
Number of medication types used			
0	49 (28.0%)	264 (34.0%)	.292
1-2	83 (47.4%)	360 (46.3%)	
3-4	32 (18.3%)	121 (15.6%)	
5+	11 (6.3%)	32 (4.1%)	
Depression			
Never	144 (82.3%)	664 (85.5%)	.227
Past	21 (12.0%)	89 (11.5%)	
12-month	10 (5.7%)	24 (3.1%)	

Note. BMI = body mass index. Values are given as median (interquartile range) or n (%).

have led to underreporting. The vestibular system, commonly implicated in postural control, is also linked with psychiatric disorders in a growing body of research and may mediate the relationship between depression and falls. A review of the literature in 2013 demonstrated support for the relationship between all of the brain regions of interest implicated in the vestibular system and MDD (Gurvich, Maller, Lithgow, Haghgoosie, & Kulkarni, 2013). Although an interaction between psychiatric symptoms and vestibular disturbance is commonly reported (Egger, Luxon, Davies, Coelho, & Ron, 1992; Eckhardt-Henn, 2008), Gurvich et al. (2013) reported inconclusive findings in their literature review. As measurements of vestibular dysfunction were not collected in the current study, further research is warranted to investigate this novel potential explanatory factor in the relationship between falls and depression. Strengths of the current study include the use of the gold-standard method of identifying depression, the age range of the cohort, and the use of a population-based cohort to investigate this relationship among men.

In this group of men, depression in the past 12 months was associated with increased risk of falls during the same period. As this finding was not explained by psychotropic drug use, age, or recognized confounders, further investigations into interactions between depression and the mechanisms of falls across the full adult range are warranted,

possibly focusing on the relationship between the vestibular system, balance, and depression. This research highlights the need for a focus on falls prevention in depressed men of any age, to prevent soft tissue injury and/or fracture and keep men healthy and active across the life span.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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