

# Falls and depression in octogenarians - life and living in advanced age: a cohort study in New Zealand

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## ABSTRACT

**INTRODUCTION:** Falls and injury have the most devastating consequences for very old people. Depression may be a significant cause and consequence of falls.

**AIM:** To examine the association between falls and depression in octogenarians.

**METHODS:** LiLACS NZ (Life and Living in Advanced Age: A Cohort Study in New Zealand), cohort study data of Māori (aged 80–90 years, 11-year age band) and non-Māori (aged 85 years, 1-year age band) followed for 3 years was used to describe the incidence and prevalence of falls and depression. Falls by self-report were accumulated over 3 years. Geriatric depression score (GDS) was ascertained at baseline.

**RESULTS:** Over 3 years, fewer Māori (47%) than non-Māori (57%) fell; 19% of non-Māori and 20% of Māori scored 5+ (depressed) on the GDS. For non-Māori and Māori, people with depression were more likely to fall than Māori not diagnosed with depression (OR 2.72, CI 1.65–4.48 for non-Māori and OR 2.01, CI 1.25–3.25 for Māori). This remained significant, adjusted for age and sex. Depression was a significant predictor of hospitalisations from falls for Māori (OR 5.59, CI 2.4–12.72, adjusted for age and sex) and non-Māori (OR 4.21, 2.3–7.44, adjusted for sex).

**CONCLUSION:** Depression and falls are common and co-exist in octogenarians. GPs thinking about falls should also think about depression and vice versa.

**KEYWORDS:** Octogenarians; falls; depression; LiLACS NZ

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## Introduction

New Zealand, like many countries, has an ageing population, with an increasing proportion of people in the older age groups and a declining proportion of children. The population aged 65 years and over has increased from 11% of the total population in 1991 to 13% in 2009 and is expected to reach 21% by 2031. Correspondingly, the number of people aged 65 years and over is projected to increase from ~550,000 in 2009 to 1 million in the late 2020s. The number of people aged 85 years and over is projected to increase from 67,000 in 2009 to 144,000 in 2031, then more than double to ~330,000 by 2061.<sup>1</sup>

Falls in older adults are a significant cause of morbidity and mortality in the elderly population, and up to one-third of adults aged over 65 years fall yearly; 22–60% of people aged 65+ years are injured yearly from a fall. Falls are the leading cause of injury-related hospitalisation and account for 40% of injury-related deaths.<sup>2</sup> In 2015, the cost of accident compensation (ACC) fall-related claims by people aged 75+ years was ~\$95 million, and this is projected to reach \$296–418 million annually by 2025. ACC falls-related claims for people aged 75+ years in Auckland alone grew from 16,931 in 2011 to 20,711 in 2015.<sup>3</sup> Worldwide falls result

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in 0.85–1.5% of total annual health-care expenditure, equivalent to 0.2% of gross domestic product and cost up to US\$26,000 equivalents per fall victim.<sup>4</sup> With population ageing, there will be many more fallers in the next decades, and people in advanced age are at particular risk of injury from falls.

Older people who fall are twice as likely to be depressed as people who do not fall.<sup>5</sup> Depression is common in old age,<sup>6</sup> but is treatable and outcomes improve with effective antidepressant therapy. We used the data from *Te Puawaitanga o Nga Tapuwae Kia Ora Tonu: Life and Living in Advanced Age: A Cohort Study in New Zealand (LiLACS NZ)* to establish and examine the prevalence of falls and the interrelationship between falls and depression.

## Method

LiLACS NZ constituted two equal sized cohorts of Māori aged between 80 and 90 years and non-Māori age 85 years. Participants were recruited from a defined geographic region – those living in the Bay of Plenty in 2010 – and followed up yearly for 6 years.<sup>7</sup> Kaupapa Māori methods were used to contact and recruit Māori participants.

Measures were made by using a comprehensive interview schedule administered by trained interviewers using standardised techniques. Sociodemographic characteristics and personal history included tribal affiliation for Māori.

## Measures

In this study, we examined falls, depressive symptoms, ethnic group, age and gender. Falls were self-reported during face-to-face interviews using the question ‘how many times have you fallen in the last 12 months?’. Medical attention from a fall and hospitalisation from a fall were also ascertained by self-report.

Depressive symptoms were ascertained using the Geriatric Depression Scale short form (GDS-15),<sup>8</sup> a well-validated scale developed for older people.

Mortality was ascertained by contact with regional interviewers and a National Health Index (NHI)-matched Ministry of Health data inquiry.

## Analyses

Descriptive statistics reported prevalence of falls and characteristics of fallers. Falls were accrued over 3 years of interviews and reported as several falls over 3 years.

Using logistic regression, fallers were examined in comparison to non-fallers, and associations with depressive symptoms examined. Predictors of hospitalisations from falls by self-report and mortality were examined.

## Results

Four hundred and twenty-one Māori and 516 non-Māori started the study, and 196 Māori and 358 non-Māori completed 3 years of the study, including 2 years of follow up (Waves 1, 2 and 3). We counted all falls over the three interviews. Significantly fewer Māori fell (196, 47%) than non-Māori (296, 57%), and the same proportion of women (271, 52%) and men (221, 53%) fell (Table 1).

Of those who fell, most fell only once over the 3 years, ~27% fell twice, 17% fell three times and up to 23% fell four or more times.

Over 3 years, 226 (24%) of people who fell sought medical attention and 58 reported a fracture (12% of fallers and 6.2% of all participants). Women reported significantly more fractures than men, and non-Māori reported significantly more fractures than Māori. Up to 10% of non-Māori women received a fracture from a fall over 10 years.

Hospitalisations from falls were also frequent, with 108 (22% of fallers and 12% of all study participants) were hospitalised after a fall, and non-Māori were almost twice as likely to be hospitalised from a fall.

Table 2 shows that for both Māori and non-Māori, having depressive symptoms (GDS score 5+) at baseline more than doubled the chance

of also having a fall over a 2-year period both in univariate and adjusted analyses.

Māori who were depressed were 5.5-fold more likely to be hospitalised for a fall than Māori who were not depressed. Similarly, non-Māori with depression were four-fold more likely to be hospitalised for a fall than non-Māori without depression (Table 3). There was no significant association between either falls or depressive symptoms and mortality over 3 years. More men died, and older age was associated with higher mortality for Māori (all non-Māori were the same age).

## Discussion

From the results, we can see that depression and falls are common and often co-exist in the older population. Non-Māori outnumbered Māori in rates of falls and morbidity from falling. Fractures and hospitalisations from falls were frequent.

Falling rates in Māori and non-Māori were higher among people who had depressive symptoms. Having depressive symptoms was also associated with being more likely to be hospitalised for a fall. This highlights the fact that clinically

Table 1. Three-year fall incidence and depression among Māori and non-Māori in advanced age

	Men		Women		OR (95% CI) Gender† (Ref: Men)	OR (95% CI) Ethnicity* (Ref: Māori)
	Māori (n = 177)	Non-Māori (n = 237)	Māori (n = 244)	Non-Māori (n = 279)		
Age (years)	82.5 (2.8)	84.6 (0.5)	82.8 (0.7)	84.6 (0.5)		
Gender (%)	42.7	57.3	46.7	53.3		
Falls						
Any	81 (45.8)	140 (59.1)	115 (47.1)	156 (55.9)	0.955 (0.736–1.240)	1.498 (1.117–2.009)*
No falls	96 (54.2)	97 (40.9)	129 (52.9)	123 (44.1)		
Number of falls						
1%	25 (30.9)	54 (38.6)	46 (40.0)	36 (23.1)		
2	21 (25.9)	32 (22.9)	33 (28.7)	46 (29.5)		
3	17 (21.0)	18 (12.9)	15 (13.1)	35 (22.4)		
≥4%	18 (22.2)	36 (25.7)	21 (18.3)	39 (25.0)		
Medical attention for a fall	31 (17.5)	68 (28.7)	54 (22.1)	73 (26.2)	1.029 (0.760–1.394)	1.347 (0.959–1.894)
Fracture from falls (self-report)	2 (1.1)	16 (6.8)	13 (5.3)	27 (9.7)	1.846 (1.039–3.278)	1.976 (1.061–3.678)
Hospitalisation from a fall	11 (6.2)	34 (14.4%)	20 (8.2)	43 (15.4)	1.133 (0.753–1.703)	1.901 (1.184–3.050)
Any depression (GDS 5+)	43 (24.3)	40 (16.9)	45 (18.4)	58 (20.8)	0.990 (0.715–1.370)	0.908 (0.631–1.308)

† Controlled for age. % determined from three waves: W1, W2, and W3 data accruing falls such that one fall per year sums to three. Data are presented as %, unless otherwise stated.

OR (odds ratio); CI (confidence interval); GDS (Geriatric Depression Scale Short Form); Ref, (reference).

Table 2. Associations between depression and falls for Māori and non-Māori in advanced age

Any Fall	OR	95% CI		P-value	OR	95% CI		P-value
		Unadjusted				Adjusted for age and gender		
Māori								
Depressed (ref not-depressed)	2.012	(1.246–3.248)		0.0042	2.003	(1.231–3.258)		0.0051
Non-Māori								
Depressed	2.722	(1.653–4.483)		<0.0001	2.756	(1.672–4.544)		<0.0001

† Logistic regression model has only 'depressed' as independent variable. OR (odds ratio); CI (confidence interval); ref (reference).

significant depression needs to be recognised and treated, and that the recognition of one factor, falls or depression, necessitates the inquiry about, and treatment of, the other.

Patients with depression display gait unsteadiness, therefore providing a mechanistic link between depression and falls. People with depression walk more slowly with decreased push off and more time with both feet spent touching the ground.<sup>9</sup> Also, there is increased stride-to-stride variability, which can lead to falls.<sup>10</sup> People who have already been diagnosed with depression may be more likely to engage in help-seeking behaviour and they may also be less likely to cope with a fall. Recent work has also shown that white matter lesions (WMLs) are associated with major depression in older people. WMLs in depressed older people correlate with a poor prognosis and are associated with decline in cognitive performance. WMLs are also associated

with gait disorders, postural abnormalities and mobility problems in older patients.<sup>11</sup> More study needs to be done to establish a possible relationship between falls, depression and WMLs.

Incorporating conversations about depression and falls into consultations with older people may both pick up and lead to better co-management of falls and depression. Previous studies have shown the usefulness of using the Beck Depression Inventory (BDI) in identifying people who have depression. The BDI identified 13.8% cases of depression among patients in a New Zealand study.<sup>12</sup> Also, brief screening tools could be used to identify people with depression in a busy general practice setting. A questionnaire that entailed two questions about depressed mood ('Have you during the past month been bothered by feeling down, depressed or hopeless?' and 'During the past month have you been bothered by little interest or pleasure in doing things?') was shown to have high sensitivity (96%) and modest specificity (57%) in identifying people with depression.<sup>13</sup>

Table 3. Associations between depression and hospitalisation from falls, and depression, falls and mortality (adjusting for gender and age) for Māori and non-Māori in advanced age

Hospitalisation from falls (self-report)	OR	95% CI		P-value
<b>Māori</b>				
Falls	Not able to be estimated			
Depressed	5.586	2.453	12.718	<0.0001
Gender	1.488	0.636	3.479	0.3596
Age	1.096	0.947	1.27	0.2189
<b>Non-Māori</b>				
Falls	Not able to be estimated			
Depressed	4.212	2.384	7.444	<0.0001
Gender	1.235	0.714	2.136	0.4499
<b>Mortality (from Ministry of Health records)</b>				
<b>Māori</b>				
Falls	0.678	0.424	1.082	0.1031
Depressed (ref not depressed)	1.166	0.665	2.043	0.592
Gender (ref male)	0.475	0.299	0.754	0.0016
Age	1.182	1.089	1.282	<0.0001
<b>Non-Māori</b>				
Any falls (ref no falls)	0.796	0.504	1.258	0.3295
Depressed (ref not depressed)	1.448	0.835	2.513	0.188
Gender (ref male)	0.758	0.485	1.184	0.2232

OR (odds ratio); CI (confidence interval); ref (reference).

Useful interventions to prevent falls include exercise programmes specifically addressing balance and lower leg strengthening. Exercises such as Tai Chi, Qigong and dance are all appropriate. Physiotherapists and fitness instructors can also develop specific exercise programmes.<sup>14</sup> The environment of the older person may need to be evaluated for falls hazards. The bathroom has been identified as the most hazardous room in the house for older people over 70 years of age due to slippery floors and absence of handrails.<sup>15</sup> Most older people's health service organisations have occupational therapists available for home hazard assessment and modification.

Some causes of falls include psychotropic medications. It is unclear whether the falls risk is the same across all groups of medications or is related to a specific drug (eg selective serotonin reuptake inhibitors (SSRIs) compared to monoamine oxidase inhibitors (MAOIs)), but studies suggests that SSRI carry as much risk as the tricyclic group of antidepressants, and the newer serotonin-norepinephrine reuptake inhibitor (SNRI) class may also carry a high risk of falls.<sup>16,17</sup>

## Limitations

In the present study, we cannot make causal attributions. Therefore, we do not know if depression was a consequence of a fall or if depression triggered the fall. Further research needs to be done on the causal mechanisms of falls in relation to depression.

## Conclusion

This study shows that there is a strong association between depression and falls in octogenarians. Morbidity from falls is greater when depression is co-existent. Consideration of identification and treatment of both falls and depression may improve outcomes for older people. Furthermore, more research needs to identify the mechanistic nature of whether falls are a consequence of depression or vice versa.

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