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Fear of Falling among Older Mexican Americans: A Longitudinal Study of Incidence and Predictive Factors

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Abstract

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Author Contributions:

L. Dierking: study design, data analysis, interpretation, and manuscript preparation.

K. Markides: data acquisition, patient recruitment, and assisted with manuscript preparation.

S. Al Snih: data interpretation and assisted with manuscript preparation.

M.K. Peek: study design, data interpretation and manuscript preparation.

Conflict of Interest Checklist:

Elements of Financial/Personal Conflicts	*Dierking		Markides		Al Snih		Peek	
	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation		X		X		X		X
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Speaker Forum		X		X		X		X
Consultant		X		X		X		X
Stocks		X		X		X		X
Royalties		X		X		X		X
Expert Testimony		X		X		X		X
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Personal Relationship		X		X		X		x

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OBJECTIVES—The purpose of this study is to determine predictors of fear of falling among older Mexican Americans over time.

DESIGN—Longitudinal study.

SETTING—Community-dwelling residents throughout California, Colorado, New Mexico, Arizona, and Texas.

PARTICIPANTS—One thousand six hundred and eighty-two community-dwelling Mexican Americans aged 72 and over participating in the Hispanic Established Populations for the Epidemiologic Study of the Elderly (H-EPESE, 2000/01 – 2010/11).

MEASUREMENTS—Fear of falling was measured at baseline and at each subsequent wave interval. Baseline demographic and clinical variables included social support, fall history, depression symptoms, Mini-Mental State Examination (MMSE), Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) limitations, and chronic health conditions.

RESULTS—Fear of falling was present in 953 subjects (56.7%) at baseline with 262 of them reporting severe fear of falling. The predictors of reporting any fear of falling over time included female gender, frequent familial interaction, depression, chronic health conditions, IADL limitations, higher MMSE score, and 3 or more falls in the last 12 months. Predictors of severe fear of falling included older age, female gender, married, depressive symptoms, chronic health conditions, IADL limitations, higher MMSE score, and fall history. Protective factors included frequent friend interaction and higher levels of education.

CONCLUSION—Fear of falling is prevalent among older Mexican American adults. The presence of friends nearby was shown to be protective, while the presence of family nearby was shown to be predictive of fear of falling.

Keywords

aging; falls; fear of falling; Mexican American

INTRODUCTION

Fall injury is one of the leading causes of both fatal and non-fatal injuries among older adults.^{1, 2} In the US in 2010, 2.3 million older adults with fall injuries presented to emergency rooms for treatment; over 650,000 of those cases resulted in hospitalization.^{1, 3} These figures are projected to increase exponentially, making fall injury one of the most preventable causes of institutionalization and loss of independence for older adults.³ In 2010, the incidence of fall injury resulted in 30 billion US dollars in direct medical costs, and this figure is estimated to increase to 67 billion US dollars by the year 2020.^{4, 5}

While 50–60% of fallers develop a fear of falling as a result, not all older adults with a fear of falling have conversely experienced a fall.^{6, 7} Fear of falling is associated with negative physical and mental health outcomes, including a decrease in activities of daily living, reduced social participation, functional decline, decreased quality of life, and risk of fall injury.⁶⁻⁸ Subsequently, when individuals begin to limit their daily activities due to loss of confidence rooted in fear of falling, the result can be decreased social participation,

community involvement, ultimately affecting functional decline and increasing risk of fallin.^{4, 9}

Common risk factors for fear of falling among older adults include being aged 80 years and older, female, lacking emotional support, a history of depression, and a history of falls.^{6, 8, 10-12} While prior research of fear of falling has compared African American older adults to non-Hispanic white older adults, relatively little research has been conducted on fear of falling in older Mexican Americans.¹³ Recent studies have also stated that the range of variations regarding predictors and risk factors of fear of falling could be attributed to a gap in the literature comparing sub populations and minority populations.^{3, 4, 11, 13-15}

Despite efforts to reduce health disparities between minority populations in the US, Mexican American older adults still present a paradox regarding morbidity and mortality in that extended years of life do not equate healthier years.^{10, 16} According to the Center for Disease Control and Prevention (CDC) in 2010, the average lifespan for Non-Hispanic Whites was 78.8 years, while for African-Americans it was 74.7 years, and 81.4 years for Hispanic Americans. Mexican Americans are one of the fastest growing older population in the US. In 2005, 15% of the US population was Mexican American; by 2050 that number is expected to increase to 25%. The purpose of this study is to determine longitudinal predictors of varying degrees of fear of falling among older Mexican Americans.

METHODS

Sample

The data for this study were from the Hispanic Established Populations for the Epidemiological Study of the Elderly (H-EPESE), an ongoing population based study of 3050 non-institutionalized Mexican Americans residing in five Southwestern states: Arizona, Texas, California, New Mexico and Colorado (83% response rate) (1993/94-2010/11). For the purpose of this analysis, data from Wave 4 (2000–2001) was treated as baseline and incidence of fear of falling was examined throughout Wave 5 (2004–2005), Wave 6 (2007–2008), and Wave 7 (2010–2011). Wave 4 was used as baseline because it was the first wave to include questions regarding fear of falling. The sampling and data collection procedures have been thoroughly documented in prior research.¹⁷ Of the 1682 subjects re-interviewed at Wave 4, 1581 were done in person while the remainder (n=101) were reported by proxy. Data taken at Wave 4 was used to estimate the probability of developing any of fear of falling and severe fear of falling during a 10-year observation. At the end of Wave 7, 1079 subjects survived while 603 subjects were lost to death, missing, or refused to participate.

Measures

Outcome—Fear of falling was assessed by one question: How afraid are you of falling? The responses were given on a 4 point Likert scale: not afraid, somewhat afraid, fairly afraid or very afraid. The 4 point Likert scale of assessing fear of falling has been utilized in prior studies.^{11, 16} Responses were recoded for analysis by creating 2 new dichotomized variables. The first variable assesses any fear of falling and was created by recoding “not afraid” as 0,

and by combining the other responses to equal 1. The second variable assesses severe fear of falling and was created by recoding “somewhat afraid” and “not afraid” as 0, while combining “fairly afraid” and “very afraid” as 1. This resulted in 2 separate variables to be used in 2 separate fear of falling models to address if predictors varied across levels of severity of fear of falling.

Independent Variables—Demographics included continuous age and education level, and dichotomous variables for both marital status (married = 1, unmarried = 0) and gender (female = 1, male = 0).

Presence of social support was measured by three variables which included: 1) whether or not the subject had anyone they felt they could “count on” to help/be there for them; 2) the number of friends [created by an aggregate of two variables: the number of friends seen monthly and the number of friends the subject can count on for help]; and 3) the number of family members [created by an aggregate of two variables: the number of family seen monthly and the number of family the subject can count on for help]. The summary variables for friends and family that could be counted on and seen monthly were left as continuous variables with the lower numbers indicating fewer friends and family available. The variables regarding individuals considered able to count on and talk to about serious matters were summarized into a dichotomized variable indicating those who had support and those who did not.

History of falls was measured by asking the respondent: “During the past 12 months, how many times did you fall and land on the floor or ground – none, one time, two times, three or more times?” A response of three or more falls in the last 12 months was considered high risk for fall (1=yes, 0=no).

Functional status was assessed by two variables: 10 instrumental activities of daily living (IADL) and 7 activities of daily living (ADL). Subjects were asked if they were able to perform a variety of typical daily physical activities regarding caring for themselves and tasks that include a range from housework to walking up and down stairs to basic hygiene tasks. ADL scores were calculated from a modified version of the Katz ADL scale.¹⁸ This created a summary score ranging from 0-10, with higher scores indicating greater limitation in functional status. The IADL scores were computed based on the Older Americans Resources and Services IADL scale.¹⁹ This created a summary score ranging from 0-7, with higher scores indicating greater limitation in functional status.

Cognitive functioning and health was measured by the Mini-Mental State Examination (MMSE) and the Center for Epidemiologic Studies Depression Scale (CES-D) scales.^{20, 21} The MMSE consists of 30 questions assessing functioning in several cognitive domains, and the CES-D Scale contains 20 items assessing depressive symptomatology in the last 2 weeks. These scales were chosen for their reliability and validity as well as the ability to provide a further examination regarding the inconsistency recently reported among fear of falling literature as it relates to cognitive function and depression.^{10, 22} Both variables were kept as continuous variables for analysis.

A summary score was created for the number of chronic conditions each subject reported based on having a doctor diagnosis. The chronic conditions included kidney disease, liver disease, osteoporosis, eye problems (cataracts, glaucoma, and macular degeneration), heart attack, diabetes, stroke, hypertension, hip fracture, and arthritis. All questions were dichotomous, with a range of 0 to 7.

Analysis

Statistical analysis was performed using SAS System 9.4 for Windows (SAS Institute, Inc. Cary, NC). The purpose of this analysis was to determine longitudinal predictors of varying degrees of fear of falling among older Mexican Americans over a 10-year period. The Mantel-Haenszel Chi-square test for categorical variables and analysis of variance (ANOVA) test for continuous variables were used with each fear of falling variable. Discrete time hazard models estimated with logistic regression were used to estimate the association of sociodemographic, social support, and health variables with the odds of developing any fear of falling or a severe fear of falling among respondents who previously reported no fear. This type of analysis included all 4 time periods, or 3 intervals (i.e., Wave 4 to 5, Wave 5 to 6, and Wave 6 to 7) in which the respondent reported no fear at the beginning of the interval. Discrete time hazard models were then used to predict who developed any or severe fear of falling by the end of the interval. Thus, the risk group consists of those who had not reported fear at the beginning of an observation interval. These types of models allowed repeated events (i.e., respondents can re-enter the risk group if they reported no fear in a later interval – essentially a “recovery” from fear of falling during the study). While there were 1,682 respondents in the sample, there are 3,281 observations. This was an indication of the degree to which older adults fluctuate in and out of fear of falling states.

Model 1 adjusted for age, sex, marital status, and education level. Model 2 additionally adjusted for social support variables. Model 3 included measures of chronic health conditions, MMSE score, ADL limitations, IADL limitations, and history of falls in the last 12 months to assess whether the above relationships were independent of health conditions and functional status. All variables were time-varying except for gender and education level.

RESULTS

Of the 1682 subjects at baseline, 56.7% reported varying degrees of fear of falling (15.6% of which were severe fear of falling). At Wave 5, 65.3% of surviving subjects reported any degree of fear of falling (23.2% of which were severe fear of falling) and 33.1% reported no fear of falling (1.9% were unknown or refused to answer). At Wave 6, 68.1% of surviving subjects reported any degree of fear of falling (20.2% of which were severe fear of falling) and 30.2% reported no fear of falling (1.7% were unknown or refused to answer). At Wave 7, 67.9% of surviving subjects reported any degree of fear of falling (31.2% of which were severe fear of falling) and 31.2% reported no fear of falling (.9% were unknown or refused to answer). From baseline, as compared to the final wave, any fear of falling increased 11.2%, and severe fear of falling increased 15.6%. No fear of falling decreased by 5.8% from baseline to the final wave.

Table 1 shows the distribution and baseline characteristics of subjects by fear of falling category. Subjects with higher than average CES-D scores, a history of falls, more chronic conditions, and more IADL limitations were more likely to report any fear of falling. Tables 2 and 3 show the probability of fear of falling over the 10-year time frame. Three Models are presented per table. These results indicate a distinction between those subjects who report any degree of fear of falling versus those who report severe fear of falling. Table 2 shows in the first model that being female is associated with increased odds of reporting any fear of falling over a 10-year period, while education appears to be associated with lower odds of reporting any fear of falling. Model 2 shows that having any relatives living nearby and seen physically monthly along with high depressive symptoms are associated with an increased odds of any fear of falling, although both predictors appear to be weakly significant. Model 3 shows that being female, high depressive symptoms, more chronic conditions, more IADLs, and a high MMSE score are all related to increased odds of reporting any fear of falling.

Table 3 shows the probability of developing any severe fear of falling. The first model shows age and female as significant predictors of severe fear of falling, while education is protective. Model 2 shows that having friends you consider close and can rely upon to see monthly appears protective, while high depressive symptoms appear predictive but are weakly significant. In Model 3, age no longer is significant, while being female remains predictive and education is protective of severe fear of falling. High depressive symptoms, high MMSE score, more chronic conditions, more ADL and IADL limitations, and a history of 3 or more falls are significant predictors of severe fear of falling.

DISCUSSION

This study examined the probability of developing fear of falling within community-dwelling Mexican American older adults. Our findings showed that fear of falling is a common concern not only for African Americans and for non-Hispanic whites, but also for Mexican Americans as well. It particularly examined the role of social support in regards to fear of falling. While prior studies have shown a connection between social support and fear of falling, understanding the differences between ethnic groups regarding social support is critical in developing interventions aimed to reduce fear of falling and lowering subsequent health outcomes and costs.^{23, 24}

The role of social support as it pertains to fear of falling is a much needed area of future research. An individual's physical health can be significantly impacted by the amount and quality of his or her social support.²⁵ However, not all social support is beneficial to health. Prior studies have documented the positive and negative health effects stemming from one's social support.^{26, 27} Social support literature for Mexican Americans specifically have shown that, while family support can be preventive of mental and physical health problems, family conflict is related to poorer health outcomes for this population.²⁵ Future research should examine the role of social support as it relates to fear of falling by looking at the quality of familial and friend support. This can be seen in this study by the evidence that having relatives nearby that one sees monthly and can count on for help appears to be

predictive of fear of falling. Conversely, having friends who are seen monthly is protective against severe fear of falling.

Prior research on Mexican American populations has shown differing results regarding the strength and impact of social support in the form of friends or family. Within the Mexican American culture specifically, family is typically considered stronger social support²⁵ Another possibility regarding the discrepancies found within social support is that self-report is based on the subject's perception, and it is possible that those who perceive they have support may also perceive their self-rated health positively.^{25, 28}

This study is unique in that we examined the development of fear of falling with 10 years of data among older Mexican Americans, allowing for the calculation of the probability of developing a fear of falling. This supports prior findings indicating that fear of falling is associated with being over 80 years old, being female, a history of falls, high depressive symptoms, higher MMSE scores, and IADL limitations; however, it also begins to explore the role of social context among minorities as it affects fear of falling.²⁹ Possible further investigation is merited to confirm that higher MMSE scores are predictive of a severe fear of falling. It is possible this outcome is due to having subjects who are higher functioning cognitively, respond more accurately to self-report questions, and are also more aware of their own limitations than those with lower MMSE scores. Another area for further examination is the relationship of degree of fear of falling to the specific categories of reported fall incidence for this specific population since both Table 2 and 3 show that a history of falls is predictive of both any fear of falling and severe fear of falling.

The 1,682 respondents and 3,281 observations in the sample shows that older adults fluctuate in and out of fear of falling states, and although there is little research that addresses the change over time in older adults' fear of falling, our data suggest that changes in fear of falling occur. These could be potentially due to changes in physical activity limitations, change in disease states, or changes in the social and/or physical environment for older adults.⁶ Since research indicates that fear of falling is a risk factor for falling,^{6, 8, 30} changes in fear of falling could be an important public health topic and a clinically relevant area to explore in future research.

The limitations include both attrition and the fear of falling variable. First, the findings of the relationship between fear of falling and predictors may have been underestimated due to both mortality and to refusals. Second, the study relies on one response to one question to determine the extent and presence of fear of falling, and the lack of additional questions can be seen as a potential concern.^{10, 22} The strengths of the study include the large sample size and the length of the study period (2000/01 - 2010/11), providing further information on predictors of fear of falling over time. Another strength is the focus on an understudied and quickly growing population. This study contributes by adding a more thorough understanding of the complexity of fear of falling among a minority older adult population.

The knowledge that fear of falling changes over time paired with the similarities and differences among those with reported any fear of falling versus those with reported severe fear of falling give researchers pause for consideration in studying this topic at only one time

point due to variability. This fact is also compounded by the possibility that developed fear and persistent fear may have differing effects on health outcomes. Activity restriction when there is no fall history, but is strictly due to the presence of fear of falling, needs to be explored further in regards to a range of physical, psychological, and functional complications. This is an important target area for future culturally specific research and subsequent interventions to be developed and implemented within minority communities.

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Table 1

Baseline fear of falling by socio-demographic and health status variables (N= 1682).

	No fear N = 622	Any fear N= 953	Severe fear N = 262
Age (y), mean $\pm$ SD	78.7 $\pm$ 5.2	79.6 $\pm$ 5.5	79.9 $\pm$ 5.6
Female, %	48.2	70.5	81.3
Married, %	55	40.8	37.4
Education (yrs), mean $\pm$ SD	5.3 $\pm$ 4.2	4.8 $\pm$ 3.9	4.5 $\pm$ 3.6
Have someone to talk to/count on about issues, %	74.8	73.2	79.1
Number of family seen monthly and feel close to, mean $\pm$ SD	2.4 $\pm$ 2.6	2.7 $\pm$ 2.7	2.3 $\pm$ 2.5
Number of friends seen monthly and feel close to, mean $\pm$ SD	2.7 $\pm$ 3.0	2.9 $\pm$ 2.9	2.5 $\pm$ 2.8
CES-D [†] score, mean $\pm$ SD	4.9 $\pm$ 6.2	8.4 $\pm$ 7.9	10.7 $\pm$ 9.1
Number of chronic health conditions, mean $\pm$ SD	1.3 $\pm$ 1.1	1.6 $\pm$ 1.1	2.0 $\pm$ 1.1
MMSE [‡] score, mean $\pm$ SD	22 $\pm$ 6.2	21.2 $\pm$ 6.3	20.0 $\pm$ 6.9
ADL [§] limitations, mean $\pm$ SD	.51 $\pm$ 1.5	1.1 $\pm$ 1.9	1.6 $\pm$ 2.2
IADL [¶] limitations, mean $\pm$ SD	1.4 $\pm$ 2.7	3.0 $\pm$ 3.4	4.6 $\pm$ 3.5
Fallen once in last 12 months, %	13.0	20.4	20.7
Fallen twice in the last 12 months, %	4.7	8.5	9.9
Fallen 3 or more times in last 12 months, %	3.2	9.6	19.9

[†] CES-D = Center for Epidemiologic Studies Depression Scale (score 0-60, higher score is high depressive symptoms)[‡] MMSE = Mini-Mental State Examination (score 0-30)[§] ADL = Activities of Daily Living (score 0-7)[¶] IADL = Instrumental Activities of Daily Living (score 0-10).

Table 2

Probability of reporting any fear of falling from Wave 4 – 2000/01 (baseline) to Wave 7 –2010/ 11.

	Model 1 N=3281		Model 2 N=1481		Model 3 N=1476	
	OR	95% CI	OR	95% CI	OR	95% CI
Age	1.00	.99-1.02	1.01	.99-1.03	.95	.95-1.00
Female	2.56	2.17-3.01	2.37	1.97-2.84	1.66	1.28-2.17
Married	.92	.78-1.09	1.04	.84-1.29	1.02	.78-1.34
Education	.96	.94-.984	.97	.99-.99	.97	.94-1.00
Have someone to talk to/count on about problems			1.04	.93-1.16	1.25	.90-1.74
Number of friends seen monthly and feel close to			1.02	.98-1.05	.98	.95-1.01
Number of family seen monthly and feel close to			1.05	1.04-1.11	1.03	1.03-1.06
CES-D [†] score			1.05	1.04-1.06	1.02	1.03-1.04
Number of chronic health conditions					1.16	1.06-1.26
MMSE [‡] score					1.02	1.02-1.06
ADL [§] limitations					.97	.88-1.07
IADL [¶] limitations					1.19	1.12-1.27
Fallen 3 or more times in last 12 months					1.22	.74-2.00

[†] CES-D = Center for Epidemiologic Studies Depression Scale (score 0-60, higher score is high depressive symptoms)[‡] MMSE = Mini-Mental State Examination (score 0-30)[§] ADL = Activities of Daily Living (score 0-7)[¶] IADL = Instrumental Activities of Daily Living (score 0-10).

Table 3

Probability of reporting severe fear of falling from Wave 4 – 2000/01 (baseline) to Wave 7 – 2010/11.

	Model 1 N=3281		Model 2 N=1481		Model 3 N=1476	
	OR	95% CI	OR	95% CI	OR	95% CI
Age	1.03	1.02-1.05	1.03	1.01-1.05	1.01	.98-1.04
Female	3.04	2.5-3.7	3.05	2.44-3.83	2.62	1.81-3.80
Married	1.1	.91-1.32	1.18	.93-1.49	1.05	.77-1.44
Education	.94	.92-.95	.96	.93-.98	.94	.90-.96
Have someone to talk to/count on about problems			.95	.84-1.07	1.03	.70-1.54
Number of friends seen monthly and feel close to			.95	.91-.97	.98	.95-1.02
Number of family seen monthly and feel close to			.98	.94-1.02	.96	.92-1.01
CES-D [†] score			1.06	1.05-1.07	1.04	1.02-1.06
Number of chronic health conditions					1.15	1.05-1.27
MMSE [‡] score					1.09	1.06-1.13
ADL [§] limitations					1.14	1.05-1.24
IADL [¶] limitations					1.24	1.16-1.32
Fallen 3 or more times in last 12 months					2.29	1.49-3.51

[†]CES-D = Center for Epidemiologic Studies Depression Scale (score 0-60, higher score is high depressive symptoms)

[‡]MMSE = Mini-Mental State Examination (score 0-30)

[§]ADL = Activities of Daily Living (score 0-7)

[¶]IADL = Instrumental Activities of Daily Living (score 0-10).