Falls Among Community-Dwelling Older Adults in Jamaica

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Abstract
The objective of this study is to estimate the prevalence of and risk factors for falling among community-dwelling older adults in Jamaica. A two-stage cluster sample design was used to recruit a nationally representative sample of 2,943 older adults. The fall prevalence in the past 6 months was 21.7%. In univariate analysis, a significantly greater proportion of women, the increasingly old, rural residents, persons with vision problems (including cataracts), and those with key chronic conditions reported falling in this period compared with those without these respective attributes (p < .05). The majority of falls reported have occurred in the home (54.3%), and restriction of activities due to fear of falling was reported by 34.6% of respondents. Logistic regression found sex, area of residence, eyesight problems, cataracts, high blood pressure, and depression to be independent risk factors for falling. The falls in older adults represent a major public health issue. Identification of modifiable risk factors in developing countries such as Jamaica may help in the development of appropriate strategies to reduce fall risk.

Keywords
falls, older adults, falls prevention, chronic diseases

Background
Falls and their sequelae are both prevalent and of significant importance among older adults. Each year about one in three older adults in the United States report a fall (Rubenstein, 2006). Developing countries such as those in Latin America and the Caribbean (Reyes-Ortiz, Al Snih, & Markides, 2005), China (Chu, Chi, & Chiu, 2005), and Africa (Moshiro et al., 2005) show a comparable prevalence, with figures ranging between 19% and 35% annually. The high prevalence of falls documented may be even higher due to underreporting of falls, which have mild or no injury (Mackenzie, Byles, & D’Este, 2006; Peel, 2000).

Falls in older adults have significant morbidity and mortality implications. Approximately 20% to 30% of older adult falls result in moderate to severe injury such as lacerations, hip fractures, or traumatic brain injuries (Kalula, n.d.; Lord, Sherriton, & Menz, 2001; Sterling, O’Connor, & Bonadies, 2001). Such injuries reduce the mobility, independence, and quality of life of older adults, and significantly increase the risk of premature death in this group (Lord et al., 2001; Rubenstein, 2006; Sterling et al., 2001). Functional decline in the ability to perform activities of daily living (e.g., being able to bathe and feed oneself), and instrumental activities of daily living (e.g., meal preparation and management of finances) are also likely. Loss of functional independence and premature death are especially worrisome among those with a hip fracture, as approximately half of these never regain functional walking ability and about 20% die within a 6-month period (Freeman et al., 2002). Falls, as the leading cause of injury-related deaths, have been steadily increasing (Tinetti, 2003).

Along with morbidity and mortality implications, both injured and uninjured persons may develop psychological complaints such as a fear of falling which result in the restriction of physical activities. This post-fall syndrome may result in social isolation, loneliness, and depression (Scheffer, Schuurmans, Dijk van, Hoot van der, & Rooij de, 2008). Ironically, due to muscle atrophy, this fear increases the risk of having a recurrent fall and increased loss of functional capacity (Delbaere, Crombez, Vanderstraeten, Willems, & Camber, 2004). These factors individually or in concert may result in early withdrawal from community-based activities, as older adults become homebound and withdrawn, and may also result in early withdrawal from formal and informal...
labor markets. Housebound older adults pose additional sources of stress on family members who are in many cases the caregivers in developing country settings.

The risk for falling is related to either extrinsic or intrinsic factors, or a combination of both; increasing numbers of risk factors in any one individual increase such risk (Rubenstein, 2006; Scheffer et al., 2008). Extrinsic factors are those external to the individual and include those related to the built environment such as uneven road surfaces and lack of sidewalks (World Health Organization [WHO], 2007). Intrinsic factors are those which are specific to the individual and include the comorbidity of chronic conditions, regular consumption of more than four drugs, sensory impairment, age, and gender (James, Eldemire-Shearer, Gouldbourne, & Morris, 2007; Rubenstein & Josephson, 2006; Todd & Skelton, 2004). Many of these represent modifiable risk factors that are amenable to public health interventions, especially at the primary health care level.

Study Rationale

Developing countries continue to face the rapid aging of their populations. By 2025, there is projected to be 839 million older adults living in these countries; this represents an increase of 500 million older adults living in relatively resource-poor countries compared with developed countries (James et al., 2007). Current trends point to increased falls and complications occurring in older adults in developing countries; it is projected that 71% of hip fractures will occur in these countries (Kalula, n.d.). Based on fall morbidity and mortality trends, and the United States estimate of direct medical costs being 30 billion U.S. dollars annually (Stevens, Corso, Finkelstein, & Miller, 2006), it is reasonable to predict that the health, social, and financial sectors of developing countries will be heavily burdened in coming years, if fall prevention efforts are not instituted.

Community-based studies on falls in older adults are limited in developing countries. A necessary first step is therefore to clearly document the epidemiological profile of high-risk groups among older adults in developing countries such as Jamaica, and to identify risk factors associated with falling. This article aims to provide information that may be used locally and in other developing countries with similar contexts.

Method

Background and Study Population

In 2012, a nationally representative survey of almost 3,000 persons aged 60 years and above was undertaken to describe the health, lifestyle, and socio-economic status of older adults in Jamaica and to document health-seeking behaviors in this population. Participants resided in four parishes in Jamaica, which together represent 47% of the national population; the parishes were selected to represent the demographic and social distribution of rural and urban populations of the country.

Table 1 shows the distribution of the sample by parish, the number of enumeration districts selected in each parish and comparison of the sample composition with the actual population distribution (Statistical Institute of Jamaica [STATIN], 2012). The figures indicate that the sample was nationally representative. The characteristics of the sample also reflect the gamut of urban/rural mix found in the Jamaica.

Sampling Methodology and Data Collection

A two-stage cluster sample with a probability proportional to size (PPS) sampling strategy was used to select participants for the survey; parish enumeration districts and households represented the first- and second-stage cluster units respectively. Upon entering a survey cluster, randomly selected coordinates were used to indicate the starting point of the survey. Trained interviewers administered the paper-based survey instrument on a face-to-face basis. Methodological details of this study have been described elsewhere (Mitchell-Fearon et al., 2014).

The data collection tool included a questionnaire of 197 questions that were structured and pre-coded; the tool also included relevant screening tools such as the Mini Mental State Exam (MMSE), Zung’s Self-Rated Depression Scale,
and the Katz Index of Independence in Activities of Daily living. Questions assessing fall prevalence, circumstances of the fall, and putative risk factors for falls were also included in the main questionnaire. Chronic disease status was based on self-reported doctor diagnoses. Data collectors were trained on variable definitions and the standardized use of the data collection instrument.

Study Variables

A fall (dependent variable) was defined as “inadvertently coming to rest on the ground or other lower level with or without loss of consciousness” (Bell, Talbot-Stern, & Hennessy, 2000, p181). Falls were measured using the question, “Have you had any falls in the past 6 months?” The time period of 6 months was chosen to minimize recall bias in this population. Prior studies have used a 6-month period for assessing fall frequency (Krishnaswamy & Usha, n.d.). Masud and Morris (2001). Note that the defined time period usually used in fall prevalence studies is 6 months or 1 year.

Independent variables were identified and included in the analysis based on putative risk factors available in the existing data set. Variables were grouped according to demography (sex, age, area of residence), vision (i.e., eyesight problems, cataracts, glaucoma), chronic conditions (i.e., hypertension, diabetes, coronary heart disease, arthritis, stroke, comorbidity), mental status (i.e., cognitive impairment, depression) and functional impairment.

Age was reported as an ordinal variable with three categories, 60 to 69 years of age, 70 to 79 years, and 80 years and above. Eyesight problems were defined as difficulty in seeing while walking outside, going up/down stairs, sewing or doing any other form of close-up work. Close-up work was defined as any work requiring focusing of eyes within 12 inches of the activity.

Cataracts, glaucoma, and chronic conditions were measured by the question “Have you ever been told by your doctor that you have the condition [ . . . ]?” Comorbidity was defined as having two or more of the following chronic conditions: hypertension, diabetes, coronary heart disease, stroke, heart failure, asthma, arthritis, seizures, and cancer.

Cognitive ability was assessed using the MMSE screening tool (Folstein, M., Folstein, S., & McHugh, P., 1975). The variable was dichotomized with 18 to 30 points representing no to mild impairment and 0 to 17 points indicating severe impairment. Functionality was assessed using the Katz Index of Independence in Activities of Daily living (Katz, Downs, Cash, & Grotz, 1970). The variable was dichotomized with a score of 6 indicating full independence and scores of 0 to 5 indicating some dependence in at least one assessed activity. Depression was assessed using the Zung Self-Rating Depression Scale (Zung, 1965). Raw scores were converted to an index in which 25 to 59 points indicate no to mild depression and 60 to 100 points indicate moderate to severe depression (Raison et al., 2005). The MMSE, Katz and Zung screening tools have high reported validity and have been used in populations of varied socio-cultural backgrounds.

Restriction of activities due to fear of falling was also assessed in this study, and was measured by the question “Do you limit your activities for fear of falling?” Fall location was measured by the question “If you have fallen in the past 6 months, where did you fall?” The answer options for this question were (a) home, (b) out, and (c) both. Indoor and outdoor falls were not able to be assessed.

Data Analysis

STATA version 11 (StataCorp, College Station, TX) was used to analyze data for this article. Univariate analyses (chi-square tests for association) were used to assess significant associations between falls and independent variables. Proportions were reported as a percent of available data only and not of the larger data set. An alpha of .05 was used as the cutoff for statistical significance.

A logistic regression model was used to determine the independent risk factors for falling in the past 6 months. All statistically significant variables identified in the univariate analyses were included in the model. For sex and area of residence, the reference groups were males and rural residence respectively. Age was maintained as an ordinal variable with the 60 to 69 age group being the reference group. For all remaining variables, the absence of the condition was the reference group. The Hosmer–Lemeshow goodness-of-fit test was used to assess model fit.

Results

The survey consisted of 2,943 persons with the mean age being 72.2 ± 8.9 years; the age range was from 60 to 103 years of age. The young-old (60-69 years) represented 44.2% of the population, the medium-old (70-79 years) 33.8%, and the old-old (80 years and older) 22.0%. The sample consisted of 52% females, who were on average older than men; the medium-old and the old-old were 30% (odds ratio [OR] = 1.3; 95% confidence interval [CI] = [1.1, 1.5]) and 50% (OR = 1.5; 95% CI = [1.2, 1.8]) more likely to be female when compared with the young-old.

Data on the variable “falls in the past 6 months” was available for 99.5% (2,929) of the sample; 21.7% (635) of those with available data reported having a fall within the last 6 months. The mean number of falls in this sample was 1.94 (SD = 1.99). In terms of demographic variables, a greater proportion of women than men reported having a fall in the past 6 months (25.5% vs. 17.5%; \( \chi^2 = 27.26, df = 1, p < .001 \)). The proportion of the population who reported a fall also increased with age (Table 2). Compared with the young-old, the old-old (OR = 1.8; 95% CI = [1.4, 2.2]) had the highest odds of falling, followed by the middle-old (OR = 1.5; 95% CI = [1.2, 1.8]). Based on sex-specific age categories,
females who were 80 years and above had the highest prevalence (29.8%) of falling in the last 6 months. A larger proportion of rural residents reported falling compared with urban residents (28.6% vs. 19.4%, χ² = 27.99, df = 1, p < .001). Having vision problems was significantly associated with reporting a fall in the past 6 months. A larger proportion of persons who reported having an eyesight problem also fell compared with those who did not have an eyesight problem.

| Table 2. Demographic and Health Profile of Older Adults, by Fall Status. |
|---------------------------------------------------------------|
| **Variable** | **Fallen in past 6 months** | **Total proportion, n (%)** | **p value** |
|---------------|-----------------------------|----------------------------|-------------|
| **Sex (n = 2,929)** | | | |
| Male | 246 (17.5) | 1,157 (82.5) | 1,403 (47.9) | <.001 |
| Female | 389 (25.5) | 1,137 (74.5) | 1,526 (52.1) | |
| **Age groups (n = 2,914)** | | | |
| 60-69 years | 223 (17.4) | 1,059 (82.6) | 1,282 (44.1) | <.001 |
| 70-79 years | 233 (23.7) | 750 (76.3) | 986 (33.8) | |
| ≥80 years | 175 (27.3) | 465 (72.7) | 644 (22.1) | |
| **Residence (n = 2,899)** | | | |
| Urban | 417 (19.4) | 1,738 (80.7) | 2,155 (74.3) | <.001 |
| Rural | 213 (28.6) | 531 (71.4) | 744 (25.7) | |
| **Eyesight problem (n = 2,735)** | | | |
| Yes | 369 (26.5) | 1,023 (73.5) | 1,392 (50.9) | <.001 |
| No | 227 (16.9) | 1,116 (83.1) | 1,343 (49.1) | |
| **Cataracts (n = 2,906)** | | | |
| Yes | 179 (28.3) | 453 (71.7) | 632 (21.9) | <.001 |
| No | 444 (19.6) | 1,821 (80.4) | 2,265 (78.2) | |
| **Glaucoma (n = 2,906)** | | | |
| Yes | 85 (25.2) | 252 (74.8) | 337 (11.6) | .090 |
| No | 538 (21.0) | 2,022 (79.0) | 2,560 (88.4) | |
| **Hypertension (n = 2,929)** | | | |
| Yes | 450 (25.1) | 1,345 (74.9) | 1,803 (61.6) | <.001 |
| No | 183 (16.3) | 942 (83.7) | 1,125 (38.4) | |
| **Diabetes (n = 2,920)** | | | |
| Yes | 203 (26.6) | 560 (73.4) | 765 (26.2) | <.001 |
| No | 428 (19.9) | 1,720 (80.1) | 2,155 (73.8) | |
| **Coronary heart disease (n = 2,908)** | | | |
| Yes | 50 (31.5) | 109 (68.6) | 159 (5.5) | .002 |
| No | 575 (21.0) | 2,165 (79.0) | 2,740 (94.5) | |
| **Arthritis (n = 2,917)** | | | |
| Yes | 270 (26.6) | 747 (73.5) | 1,020 (35.0) | <.001 |
| No | 356 (18.8) | 1,535 (81.2) | 1,891 (65.0) | |
| **Stroke (n = 2,913)** | | | |
| Yes | 78 (32.6) | 161 (67.4) | 240 (8.2) | <.001 |
| No | 546 (20.5) | 2,119 (79.5) | 2,665 (91.8) | |
| **Comorbidity (n = 2,929)** | | | |
| Yes | 376 (27.3) | 1,002 (72.7) | 1,378 (47.1) | <.001 |
| No | 259 (16.7) | 1,292 (83.3) | 1,551 (53.0) | |
| **Cognitive impairment (n = 2,768)** | | | |
| Yes | 79 (25.8) | 227 (74.2) | 306 (11.1) | .031 |
| No | 504 (20.5) | 1,958 (79.5) | 2,462 (89.0) | |
| **Functionally able (n = 2,893)** | | | |
| Yes | 556 (20.7) | 2,125 (79.3) | 2,681 (92.7) | <.001 |
| No | 66 (31.1) | 146 (68.9) | 212 (7.3) | |
| **Depression (n = 2,436)** | | | |
| Yes | 136 (34.7) | 256 (65.3) | 392 (16.1) | <.001 |
| No | 372 (18.2) | 1,672 (81.8) | 2,044 (83.9) | |

Note. Proportions are reported as percentages of available data.
This was true of cataracts, where 28.3% of those with cataracts reported a fall compared with 19.6% of those with no cataracts. Glaucoma was not found to be associated with falling (Table 2).

All assessed chronic conditions were found to be significantly associated with falling in the past 6 months. Stroke and coronary heart disease were the conditions that had the highest proportion of respondents reporting a fall (32.6% and 31.5%, respectively). More than a quarter of persons with hypertension, diabetes, and arthritis also reported falling in the last 6 months. Of those with a comorbidity, 27.3% reported having fallen in the past 6 months compared with only 16.7% of those without a comorbidity (Table 2).

Cognitive impairment, functional disability, and depression had in excess of 25% of persons reporting a fall in the past 6 months; fall prevalence was significantly higher than those of persons without such conditions ($p < .05$). Depression (34.7%) was the condition with the largest proportion of persons reporting a fall, followed by functional disability (31.1%) and cognitive impairment (25.8%; Table 2).

**Restriction of Activities Due to Fear of Falling**

In terms of community-based activities, 34.6% ($n = 956$) of the study population reported limiting their activities due to a fear of falling. A higher proportion of females reported limiting their activities compared with males (41.4% vs. 27.0%; $p < .001$). Compared with the young-old, the medium-old (OR = 1.4; 95% CI = [1.1, 1.6]; $p = .002$) and the old-old (OR = 2.0; 95% CI = [1.6, 2.5]; $p < .001$) had increased odds of restricting their activities due to this fear.

**Location of Falls**

Location of falls was assessed as occurring either in the home, while “out,” or having occurred in both places in the past 6 months. The largest proportion of respondents reported having only fallen in the home (54.3%; $n = 304$), while a smaller proportion reported the fall occurring while they were “out” (36.4%; $n = 204$) and the smallest proportion reporting having fallen in both places (9.3%; $n = 52$). Falls in the home only were reported by women almost twice as much as by men (65.3% compared with 34.4%).

**Logistic Regression**

In the logistic regression analysis, the model was correctly specified (i.e., how well the model fits the data) and was not rejected based on the Hosmer–Lemeshow goodness-of-fit results ($p > .05$; Table 3). Colinearity between variables was also assessed and only identified between comorbidity and high blood pressure; this was assessed to be a moderately high correlation ($r = .61$). In this adjusted model, the factors that remained as significant, independent risk factors for falls in the past 6 months were sex, residence (urban/rural), having an eyesight problem, cataracts, high blood pressure, stroke, or depression ($p < .05$).

| Risk factor | Adjusted OR (95% CI) | $p$ value |
|-------------|----------------------|-----------|
| Sex         |                      |           |
| Female      | 1.32 [1.04, 1.67]    | .024      |
| Age         |                      |           |
| 70-79 years | 1.16 [0.89, 1.49]    | .269      |
| ≥80 years   | 1.24 [0.91, 1.68]    | .166      |
| Residence   |                      |           |
| Urban       | 0.59 [0.46, 0.75]    | <.001     |
| Vision problems |                |           |
| Eyesight problems | 1.35 [1.07, 1.70] | .010      |
| Cataracts   | 1.42 [1.10, 1.84]    | .008      |
| Chronic conditions |            |           |
| High blood pressure | 1.48 [1.09, 2.00] | .012      |
| Diabetes    | 0.93 [0.70, 1.24]    | .634      |
| CHD         | 1.22 [0.79, 1.91]    | .371      |
| Arthritis   | 1.06 [0.80, 1.41]    | .716      |
| Stroke      | 1.47 [1.00, 2.17]    | .049      |
| Comorbidity | 1.15 [0.78, 1.69]    | .486      |
| Mental status |                |           |
| Cognitive impairment | 1.14 [0.80, 1.62] | .460      |
| Functionality | 1.01 [0.64, 1.58]  | .965      |
| Depression  | 1.66 [1.26, 2.19]    | <.001     |

Note. (Reference groups: Male, 60-69 years, rural, no disease). Hosmer–Lemeshow goodness of fit, $\chi^2(8) = 6.54; p = .587$. OR = odds ratio; CI = confidence interval; CHD = coronary heart disease.
In the adjusted model, women were 1.32 times more likely to report a fall in the past 6 months than were men (adjusted odds ratio [aOR] = 1.32; 95% CI = [1.04, 1.67]). Urban residents were more than 40% less likely to report a fall during this period than rural residents (aOR = 0.59; 95% CI = [0.46, 0.75]). Age did not remain a significant risk factor after adjustment (p > .05; Table 3).

The variables related to vision remained significant in the adjusted model, with persons reporting an eyesight problem having a 1.35 times (aOR = 1.35; 95% CI = [1.07, 1.70]) increased risk of falling and those with cataracts having an even higher risk at 1.42 times (aOR = 1.42; 95% CI = [1.10, 1.84]; Table 3). High blood pressure and stroke were the only chronic conditions that were determined to be independent risk factors in the adjusted model; both conditions showed an increased fall risk of almost 50% when compared with those without the respective conditions (Table 3). Cognitive impairment and loss of functionality were not statistically significant in the adjusted model. Depression, however, remained as an independent risk factor; risk increased by 66% when compared with those with no depression (OR = 1.66; 95% CI = [1.26, 2.19]; Table 3).

Discussion

This first analysis, focusing on falls among community-dwelling older adults in Jamaica, suggests that falls is a significant issue. One in five persons reported falling in the last 6 months, with females being more likely to report falling than males. Stenhagen, Ekström, Nordell, and Elmståhl (2013) reported comparable prevalence estimates of 19.1% and 13.3% in separate assessments of 6-month fall prevalence among a Swedish cohort of older adults. In India, a 2003 study documented a prevalence of 14% for at least a single fall in the last 6 months (Krishnaswamy & Usha, n.d.). Many studies in developed countries have reported 12-month fall prevalence estimates. Such rates are not quoted here as they are not directly comparable with our figures.

The higher occurrence of falls among females is consistent with that reported by Stenhagen et al. (2013). Other studies report alternative findings, including no difference (Stevens, Mack, Paulozzi, & Ballesteros, 2006), higher rates among men (Bell et al., 2000; Pereira, Baptista, & Infante, 2013), and similar rates by sex among the younger-old but higher rates for women among the older-old (Todd & Skelton, 2004). The variation in findings likely reflects differences in populations studied, as well as, gender differences in morbidity status, activity profile, and environmental conditions. One study has suggested that higher rates among women, as found in our study, may be the result of differences in postural control and biomechanics (Wolfson, Whipple, Derby, Amerman, & Nasher, 1993).

One third reported restriction of activities due to fear of falling. Fear of falling has been identified as a serious issue with the potential to impact daily living among older adults. Early work by Scheffer et al. (2008) reported fear of falling developing after a fall in 20% to 39% of older adults who previously had no fear of falling. Consequences of fear of falling including declining quality of life and limitation of social activity have been described (Cumming, Salkeld, Thomas, & Szonyi, 2000; Li, Fisher, Harmer, McAuley, & Wilson, 2003). More recently, social isolation particularly among visually impaired older adults due to fear of falling has been highlighted (Wang et al., 2012). In developing country settings such as Jamaica, the psychological entity “fear of falling” can be easily overlooked in busy clinical care settings as it is often less visible and less dramatic than the physical consequences of falling. This argues for direct inquiry concerning falls and fear of falling in older adults. Early rehabilitative efforts including balance training and confidence building can help find a compromise between the fear of falling as a protective mechanism and that as a barrier to maintaining physical and social health.

Most persons (63.6%) reported having fallen at home. Williams-Johnson, Wilks, and McDonald (2004) and James et al. (2007) support findings that the majority of falls among Jamaican older adults occur within the home. The home is therefore a key area to be assessed for fall hazards and targeted for fall-proofing through both preemptive and corrective measures. Such efforts may extend to changing cultural norms and preferences. For example, in the Jamaican setting, great value is placed on highly polished, shiny floors, signifying a well-maintained house. However, these very smooth surfaces increase the risk of falling. Culturally nuanced approaches to fall prevention in the home are thus required.

Rural dwellers were at a greater risk of falling than urban residents. Similar urban/semi-urban–rural differences have been reported by Bekibele and Gureje (2010) and Wojszel and Bieł (2004). Contributory factors to the observed differences in the Jamaican setting include environmental mediation through increased presence of sidewalks, paved surfaces, and better housing stock in urban settings, which protect against falling. Topography may play a role as well. In our study, most urban areas were in coastal flatland in contrast to rural hinterlands which were more varied, with a mix of hilly, rocky, and flat terrain. In one landmark Ecuadorean study, the fall rate among older persons was significantly higher in the mountainous areas than in coastal areas (Orces, 2013), suggesting that topography was a contributing factor. Further comparison of rural highland areas with urban highland areas showed higher rural prevalence. The latter finding argues for further analysis of non-topographic factors that may be associated with infrastructural development and the built environment. Although in the Ecuadorean study place of residence was not statistically significant in multivariate analysis, its possible interaction with other factors cannot be completely discounted as there was a clear trend for risk of falling to increase as the number of risk factors increased. Some studies have found no independent relationship...
between domicile (rural/urban) and risk of falling (Hanlon, Landerman, Fillenbaum, & Studenski, 2002; Payne, Perkin, & Payne, 2003), while more recently Durazo et al. (2011), after adjusting for demographic variables, have found lower rates of repetitive falling among older adult in suburban areas compared with rural and urban counterparts. Domicile (urban/rural) as a risk factor, is yet to be fully elucidated.

Reports of eyesight problems and of cataracts were associated with falling, findings which concur with the literature (Orces, 2013; Todd & Skelton, 2004). The association is not surprising as impaired vision impacts balance/gait, and increases the difficulty of navigating clutter, uneven surfaces, and objects in the environment. Depth perception, which aids walking cadence and stability (Spaulding et al., 1994) when poor, also increases the risk of falling. Impaired proprioception, which may accompany aging, is partially compensated through visually mediated responses. When vision is no longer optimal, this effect is reduced, making falls more likely (Steinweg, 1997).

The association between falls and chronic conditions varied. In the adjusted model, falls were more likely among persons with hypertension and stroke. No association was found with diabetes, arthritis, and coronary heart disease. The latter findings are consistent with patterns observed in another developing country study (Orces, 2013). The effect of hypertension is possibly mediated through drugs. Persons who are hypertensive often take medication which can result in drug-induced orthostatic hypotension, which is known to increase the likelihood of falling (Gangavati et al., 2011). In addition, people with hypertension may suffer from cerebrovascular hemorrhages which result in falls. Uncontrolled high blood pressures can lead to disorientation, dizziness, and ultimately falls. Strokes which are mainly the consequence of thromboembolic phenomena in the brain often lead to neurological deficits, impaired balance, and coordination; all of which increase the risk of falling. In our study, arthritis was not an independent risk factor for falls, whereas the contrary has been documented in other studies (Sturnieks et al., 2004; Todd, & Skelton, 2004). The variation in results could be due to persons with arthritis in our setting restricting physical activity, resulting in fewer opportunities for falling. Other variations could be due to the way arthritis is defined and measured. In our study, arthritis was a general, all-encompassing term irrespective of joints affected, whereas other studies focused specifically on lower limb arthritis and its relation to falling.

Previous studies reported an association between falls and depression in older adults. Our study mirrors such findings. Explanatory links between depression and falls are however unclear and the relationship plausibly bi-directional. Falls may result in the restriction of physical and social activities, decreased self-esteem and self-efficacy, which can lead to depression. Conversely, Kerse et al. (2008) have discussed possible pathways from depression to falls. These include depression being associated with abnormal gait and postural defects which increased risk of falling, the mechanism being physiological rather than psychological. Depression can also be associated with fear of falling causing stride-to-stride inconsistency and increased risk of falling. Similarly, depression can negatively impact functional status, increase disability and risk of falls. Use of selective serotonin reuptake inhibitors for depression can iatrogenically cause postural hypotension, increasing the occurrence of falls. We posit that all the preceding mentioned by Kerse et al. help explain the falls–depression association observed in the Jamaican setting.

A number of risk factors for falls have been clearly identified in this survey of community-dwelling elderly. This is a critical step in addressing modifiable risk factors. In developing country settings such as Jamaica, the approach to reducing falls among older adults must be tailored to reflect the limitations of human and financial resources. The engagement of primary health care services in educating the public, identifying fall hazards, and increasing older adults’ self-efficacy in mitigating risks for falls is of paramount importance. Further research is warranted regarding other risk factors for falls, as well as, the impact of falls on the lives of older adults in Jamaica and similar developing countries.

**Strengths and Limitations**

This article represents one of the few recent studies reporting nationally representative prevalence on falls and risk factors from a developing country. The large sample size in this article and the analytic approach that involved adjusting for potential confounders are strengths. Overall, our study adds to the growing global body of knowledge concerning falls.

Limitations of the study are recognized. Ideally, objectively confirmed existence of chronic disease is preferred rather than self-reported doctor-diagnosed disease. Self-reported doctor-diagnosed disease may be influenced by access to and use of health professional services. However, self-reported doctor-diagnosed disease is still useful and has been found in various studies to be reliable (Lampe, Walker, Lennon, Whincup, & Ebrahim, 1999; Miller et al., 2008). Potential methodological limitations of cross-sectional studies also apply here; for example, recall bias regarding falls and the inability to establish causal relationships between falls and risk factors studied. Factors mentioned in the literature, for example, postural hypotension, balance/gait disorders, and environmental conditions, were not included in the analysis as these were not part of the data set.

Data on independent variables was missing for some observations, with data completeness ranging from 82.8% to 99.5%. For all independent variables except cognitive impairment, rates of falling among those with missing data were similar to those for whom data were available. For cognitive impairment, however, those with missing data were significantly more likely to report a fall than those with available data. Persons with missing cognitive impairment data may have been those with severe cognitive impairment.
who could not be assessed using the conventional MMSE tool. This may have resulted in an underestimation of the association between falls and cognitive impairment (i.e., a systematic bias).

Conclusion

Falls in older adults are of high public health importance, having many long-term implications on the health of individuals, and on community and national development. Falls are a frequent occurrence in Jamaican older adults and prevalence is comparable with estimates from other studies. Risk factors identified in this study, and supported by other studies include being female, living in a rural area, having vision problems, high blood pressure, and depression. The identification of risk factors is a starting point for the development of interventions to reduce falls among older adults.

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