ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2013;94:616-21

ORIGINAL ARTICLE

Falls in People With Multiple Sclerosis Who Use a Walking Aid: Prevalence, Factors, and Effect of Strength and Balance Interventions

Susan Coote, PhD, Neasa Hogan, PhD, Sue Franklin, PhD

From the Department of Clinical Therapies & Centre for Physical Activity and Health Research, University of Limerick, Limerick, Ireland.

Abstract

Objectives: To investigate falls prevalence, factors associated with falling, and the effects of balance and strengthening interventions on falls in persons with multiple sclerosis (MS).

Design: Baseline and posttreatment data from a randomized controlled trial.

Setting: Community.

Participants: People with MS (N = 111) who use bilateral support for gait.

Interventions: Group and one-on-one physiotherapy.

Main Outcome Measures: Falls prevalence was assessed using retrospective recall. Demographic information was collected, impairments of body function were assessed, and results from the Berg Balance Scale, 6-minute walk test (6MWT), Multiple Sclerosis Impact Scale-29 version 2 physical and psychological scores, and the Modified Fatigue Impact Scale (MFIS) were obtained.

Results: The prevalence of falls in a 3-month period was 50.5% among participants with MS, of whom 28% had more than 1 fall. Fallers had a greater physical (mean difference, −3.9; $P = .048$) and psychological (median difference, −4.5; $P = .001$) impact of MS and a greater impact of fatigue (mean difference, −9.4; $P = .002$). A logistic regression analysis found that the MFIS score made a unique, significant contribution to the model (odds ratio = 1.04; 95% confidence interval, 1.018−1.079), correctly identifying 68% of fallers. A 10-week group physiotherapy intervention significantly reduced both the number of fallers (58.3% before to 22.9% after intervention, $P = .005$) and the number of falls (63 before to 25 after intervention, $P = .001$).

Conclusions: The prevalence of falls is high in this population of persons with MS, and the impact of MS and of fatigue is greater in fallers. Development and evaluation of interventions to reduce falls risk and the transition to faller or multiple faller status are required.

Archives of Physical Medicine and Rehabilitation 2013;94:616-21

Falls are a significant problem for both the person who falls and the health care system. At a personal level, falls can lead to pain, injury, or fracture. This can lead to increased reliance on others for assistance, fear of falling, and activity curtailment. At a societal level, the medical costs of falls and fractures are great, as are the costs incurred because of loss of income and increased care needs.

For people with multiple sclerosis (MS), the prevalence of falls is estimated to be between 52% and 55% in retrospective studies[1-3] considering self-reported falls in the last 2 to 12 months. Prospective reports suggest similar proportions, with between 48%[4] and 63%[5] of people falling. This is significantly greater than the prevalence in elderly populations where a large epidemiologic[6] study suggested that 15.9% of elderly people fell in a 3-month period.

In addition to a higher incidence of falling, people with MS have an increased fracture risk because of a reduction in bone mineral density as a result of decreased mobility, vitamin D deficiency, and the use of glucocorticoids and antidepressants.[7] Recent studies in the United Kingdom[8] and the Netherlands[9] found that the risk of hip fracture in people with MS was higher than in the general population, and that people with MS with a history of falling had double the risk of osteoporotic fracture.[8] The incidence of falls was significantly greater in people with

Presented to the European Committee for Treatment and Research in Multiple Sclerosis, October 13–16, 2010, Gothenburg, Sweden.

Supported by Multiple Sclerosis Ireland through the Getting the Balance Right Project.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

Clinical Trial Registration Number: ISRCTN77610415.

0003-9993/13/$36 - see front matter © 2013 by the American Congress of Rehabilitation Medicine
http://dx.doi.org/10.1016/j.apmr.2012.10.020

MS[10] than in healthy controls, even in those in the early course of MS. The risk of an injurious fall was 3 times higher for women veterans with MS than for women veterans without MS after controlling for age and number of clinic visits.[11]

Several studies have investigated the factors relating to falls in people with MS. The factors that are most common are deficits of balance (7 studies),[1,2,4,12-15] walking aid use and lower mobility status (6 studies[2,5,12,14,16,17]), and a higher Expanded Disability Status Score (6 studies[4,5,10,13,14,17]). Other authors have found that impairments of muscle tone and proprioception,[5] continence,[1] brainstem and middle cerebellar peduncal lesions,[13] and increasing numbers of symptoms[16] are associated with falls. Fear of falling and activity curtailment,[18] and cognitive deficits[17] are also associated with falls in people with MS. There are a variety of symptoms that predict falling. The fact that these symptoms can occur in various combinations highlights the complexity of this problem and its management.

Despite the increased prevalence of falls and related injuries, and the ever-increasing body of work to investigate the factors associated with falls in people with MS, there are very few studies with the aim of reducing fall risk or that evaluate falls as an outcome. Although several studies[19-21] have reported positive outcomes on balance, only 2 studies were found that have considered number of falls as an outcome. Cattaneo et al[19] evaluated balance programs based on sensory and motor strategies, and motor strategies alone and found a significant difference between groups in the number of falls that was not present preintervention. Esnouf et al[22] found that those people using a drop-foot stimulator had significantly fewer falls than those participating in an exercise program focusing on core stability. While both studies suggest positive outcomes on number of falls, the small number of studies highlights the need for development and evaluation of interventions to reduce both fall risk and the number of falls.

The aim of this article is to present the falls data for a cohort of people with MS who were assessed as part of a randomized controlled trial of interventions for people with MS who use bilateral assistance to walk outdoors. The article presents data on falls prevalence over a 3-month period before intervention, the factors associated with falls, and the effect of 2 physiotherapy interventions and yoga on number of fallers and number of falls in the sample.

Methods

These data were part of the baseline assessments of 1 arm of an exercise trial, the methods of which have been published previously.[23] Participants were stratified according to their mobility, and these data include people with MS who scored 3 or 4 on the Guys Neurological Disability Rating Scale (GNDS) mobility section (indicating use of bilateral aids for gait and/or occasional wheelchair use for longer distances). Ethical approval was obtained for all the testing sites, and patients gave written informed consent.

List of abbreviations:

BBS	**Berg Balance Scale**
GNDS	**Guys Neurological Disability Rating Scale**
MFIS	**Modified Fatigue Impact Scale**
MS	**multiple sclerosis**
MSIS-29v2	**Multiple Sclerosis Impact Scale-29 version 2**
6MWT	**6-minute walk test**

Measures

A fall was defined as "an unexpected contact of any part of the body with the ground." Falls status was established by asking 2 questions: (1) Have you ever fallen? and (2) Have you fallen in the last 3 months? If participants responded yes to the second question, they were asked how many times they had fallen in the last 3 months. Participants were asked retrospectively about the number of falls in the 3 months before the baseline assessment. They then received the interventions for a 10-week period and were reassessed at week 12, during which they were asked about the number of falls in the 3 months before that assessment.

At impairment level, lower limb sensation was evaluated using a simple verbal numerical rating scale, with 0 indicating no feeling at all and 10 indicating normal sensation. Three areas of the lower limb were tested bilaterally; thus a total of 60 indicated normal sensation. Proprioception was assessed by placing participants' big toe in an "up" or "down" position and asking participants to identify where their toe was. It was scored as either normal or abnormal.

At activities level, balance was assessed using the Berg Balance Scale (BBS), a 14-item clinical scale that evaluates balance in sitting and standing and rates performance from 0 (cannot perform) to 4 (normal performance). It has been demonstrated to have good reliability[24] and validity[25] for people with MS. Walking endurance was measured using the 6-minute walk test (6MWT). This measures walking distance over a 6-minute period and is a good predictor of habitual walking.[26] Studies have suggested that it is valid[27] and reliable[28] for people with MS. Subjects were instructed to walk "as fast and as safely as possible."[29]

At participation level, the Multiple Sclerosis Impact Scale-29 version 2[30] (MSIS-29v2) physical and psychological components were used. The impact of fatigue was measured using the Modified Fatigue Impact Scale[31] (MFIS).

The data from the baseline assessments in week 1 were used in this analysis.

Interventions

Participants were randomly assigned to take part in group physiotherapy, one-to-one physiotherapy, or yoga. All interventions were for 1 hour per week for 10 weeks. The median number of sessions attended was 8, 9, and 8 for group physiotherapy, one-to-one physiotherapy, and yoga, respectively. The group physiotherapy intervention focused on a standardized program of 6 exercises designed to target both balance and strength, and is outlined in the study protocol.[23] One-to-one physiotherapy was at the discretion of the treating therapist, but data gathered from the treating therapists revealed that they also focused on exercises to improve balance and strength. Data from the yoga instructors suggested that they focused on relaxation exercises, meditation, breathing techniques, stretching, and maintaining different yogic postures and poses.

Analysis

Data were coded and entered into an Excel[a] spreadsheet and imported into SPSS[b] for analysis. Descriptive statistics were used to identify the prevalence of falls in the cohort. To assess any significant differences between fallers and nonfallers for the