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Falls in RAC-OST-POL Study — epidemiological study in postmenopausal women aged over 55 years

Upadki u kobiet po menopauzie w wieku ponad 55 lat w epidemiologicznym badaniu RAC-OST-POL

Wojciech Pluskiewicz[1], Piotr Adamczyk[2], Aleksandra Czekajło[3], Władysław Grzeszczak[4], Bogna Drozdzowska[5]

[1]Medical University of Silesia in Katowice, School of Medicine with the Division of Dentistry, Metabolic Bone Diseases Unit, Department and Clinic of Internal Diseases, Diabetology, and Nephrology, Zabrze, Poland
[2]Medical University of Silesia in Katowice, School of Medicine with the Division of Dentistry, Department and Clinic of Paediatrics, Zabrze, Poland
[3]Department of Nephrology, Racibórz, Poland
[4]Medical University of Silesia in Katowice, School of Medicine with the Division of Dentistry, Department and Clinic of Internal Diseases, Diabetology, and Nephrology, Zabrze, Poland
[5]Medical University of Silesia in Katowice, School of Medicine with the Division of Dentistry, Department of Pathomorphology, Zabrze, Poland

Abstract

Introduction: Falls are often noted in elderly women. They may have serious clinical consequences. The aim of the study is the presentation of epidemiological data on falls in postmenopausal women.

Material and methods: A total of 978 women in mean age 65.9 ± 7.6 years from the population of Raciborz district were included. In a questionnaire the following data were gathered: falls in last 12 months, place of stay, kind of job, marital status, education, smoking, underlying diseases, and used medications.

Results: Falls occurred in 328 women (33.5%). The number of falls correlated positively with increasing age, ($r = 0.13$, $p < 0.0001$). The falls rate was not related to weight and height, but weak, significant correlation with body mass index was noted ($r = 0.076$, $p < 0.05$). Among 286 women with prior osteoporotic fracture falls were present in 40.9%, which was significantly more than the 30.4% seen in women without fracture (Chi-square test; 10.05; $df = 1$; $p < 0.01$). Falls were fewer often among women from the city of Raciborz (29.8%) than in women from the rural population (39.7%). After adjustment for age, rural stay, diabetes type 1, renal failure, rheumatoid arthritis, bronchial asthma, and depression revealed influence on falls occurrence. As was shown by logistic regression, age, rural stay, prior fracture, diabetes type 1, bronchial asthma, and depression increased the risk of fall. The cumulative number of these risk factors correlated with the number of falls ($r = 0.22$, $p < 0.000001$).

Conclusions: Falls are common among postmenopausal women, and their occurrence is modified by several factors including age, place of stay, and some co-morbidities. **(Endokrynol Pol 2016; 67 (2): 185–189)**

Key words: *epidemiology; falls; women*

Streszczenie

Wstęp: Upadki są częste u starszych kobiet i mogą powodować wiele poważnych konsekwencji. Celem pracy było przedstawienie występowania upadków w epidemiologicznej próbce kobiet po menopauzie.

Materiał i metody: W badaniu brało udział 978 kobiet po menopauzie w średnim wieku 65,87 ± 7,63 lat z powiatu raciborskiego. W kwestionariuszu zebrano dane dotyczące upadków w okresie 12 miesięcy przed badaniem, miejsca zamieszkania, rodzaju pracy, stanu cywilnego, wykształcenia, palenia tytoniu, chorób i stosowanej terapii.

Wyniki: Upadki wystąpiły u 328 kobiet (33,54%). Liczba upadków wzrastała z wiekiem ($r = 0,13$, $p < 0,0001$). Masa ciała i wzrost nie wpływały na występowanie upadków, a słaby, ale znamienny wpływ wykazywał indeks masy ciała ($r = 0,076$, $p < 0,05$). Wśród 286 kobiet z wcześniejszym złamaniem osteoporotycznym upadki zanotowano u 40,9% pacjentek, znamiennie częściej niż u kobiet bez złamań, u których upadki zanotowano u 30,4% (Chi-square test; 10,05; $df = 1$; $p < 0,01$). Upadki były rzadsze u kobiet z Raciborza (29,8%) niż kobiet z terenów wiejskich (39,7%). Na częstość występowania upadków, po uwzględnieniu wieku, miało wpływ zamieszkanie na wsi, cukrzyca typu 1, niewydolność nerek, gościec stawowy, astma oskrzelowa i depresja. Za pomocą regresji logistycznej wykazano, że wiek, zamieszkanie na wsi, wcześniejsze złamanie, cukrzyca typu 1, astma oskrzelowa i depresja zwiększały ryzyko upadków. Im większa była liczba tych czynników, tym ryzyko upadków wzrastało ($r = 0,22$, $p < 0,000001$).

Wnioski: Upadki są powszechne u kobiet po menopauzie, a na ich występowanie wpływ mają wiek, miejsce zamieszkania i niektóre choroby. **(Endokrynol Pol 2016; 67 (2): 185–189)**

Słowa kluczowe: *epidemiologia; upadki; kobiety*

Prof. Wojciech Pluskiewicz M.D., Department and Clinic of Internal Diseases, Diabetology, and Nephrology — Metabolic Bone Diseases Unit in Zabrze, 3 Maja Str. 13/15, 41–800 Zabrze, Poland, phone/fax: +48 32 370 43 89, e-mail: osteolesna@poczta.onet.pl

Introduction

Falls are common among the elderly population, and they are a factor increasing fracture risk. Falls also contribute to several important medical complications, including soft tissue injures, longstanding pain, affection of functional status, reduced quality of life, and increased mortality. The prevalence of falls has been estimated at 28–35% in community-dwelling, older people aged 65 years, and up to 42% in those over 75 years [1]. In baseline analysis performed in women from the RAC-OST-POL study, falls occurred in 33.8% [2] per year. One of the most significant consequence of falls are fractures [3]. Serious injuries occur with 10–15% of falls, resulting in fractures in any locality in 5% and in hip fractures in 1–2% [4]. Older people with injures following falls are found to have a subsequent increase in institutional care, a decline in functional status, and an increased use of medical care [1].

Osteoporotic fractures are related to two main risk factors: low bone mineral density (BMD) and falls. With ageing BMD decreases and the frequency of falls increases. Among elderly subjects the role of BMD as a risk factor for fracture decreases, and falls become the main risk factor. Moreover, falling may affect BMD through increased immobility from self-restriction of activities because after their first fall 30% of subjects develop a fear of falling [5]. Therefore, knowledge on the frequency of falls and the circumstances modifying their occurrence is one of the most important aims in planning elderly patient management.

In the population-based, epidemiological RAC-OST-POL study we gathered data on postmenopausal women older than 55 years of age, and these results were presented in several publications [2, 6–10]. In the current paper we present data concerning occurrence of falls with regard to several aspects.

Material and methods

Women creating the cohort of the RAC-OST-POL study were randomly selected from the local population of the entire Raciborz district. The number of randomly selected women was 625, and in previously published manuscripts the analyses were performed in that exact cohort of 625 women. However, besides women invited by letter sent by regular post an additional 353 women who also came 'as volunteers' were included in the study. In order to present data in a greater cohort we decided to add these women to the previously described, original, randomly recruited group [2]. Prior to this decision we checked whether fall prevalence was dependent on the means of recruitment (random or initiated by the patient). As was shown by Chi-square test, falls occurrence did not differ among them (33.8% in random population and 33.1% in non-random population, $p = 0.84$). This allowed us to combine all women in one larger group of 978 subjects. In a questionnaire described earlier in detail [2] data were gathered. Women were asked about falls that occurred within 12 months preceding the day of review. The event of fall was defined and described to the responders as an accident starting in standing position with sudden loss of balance resulting in falling down onto the ground or towards the ground without any intention to do that. Accidents that happened on horizontal surfaces or on stairs were considered. Falls from higher than the responder's height (e.g. from trees, stepladders, roofs of buildings, etc.) were not included.

Statistics

All calculations were done using Microsoft Office Excel and Statistica software (StatSoft, Inc., 2008, Tulsa, OK; STATISTICA, www.statsoft.com) on a PC. Descriptive statistics of quantitative values were presented as mean values and standard deviations (SD). The distribution of analysed data was verified by the Shapiro-Wilk test. The t-test for independent samples was performed for the comparison of continuous parameters between subgroups. The presentation of qualitative features was done by providing the number of subjects and the percentage value in defined subgroups. The comparisons of frequency of qualitative features between subgroups were performed by the Chi-square test. In order to achieve age-adjustment when necessary, ANCOVA analysis with age as a covariate was additionally performed. Correlation analysis was performed by Spearman correlation test. The traits with strongest association with falls were finally identified in logistic regression. All p values < 0.05 were considered statistically significant.

Results

The basic statistics for the whole study cohort, as well as for subgroups with and without falls, are presented in Table I. Falls occurred in 328 women (33.5%). As one might expect, women with prior falls were older than those without falls. The number of falls increased with age (Fig. 1), and the correlation between age and number of falls, although weak, was statistically significant ($r = 0.13$, $p < 0.0001$). The mean age in women without falls was 65.2 ± 7.5 years, whereas in women with one fall it was 66.8 ± 7.6 years, and in women with multiple falls (more than one fall) it was 67.9 ± 7.9 years. Women without falls were significantly younger than those with one fall ($p < 0.01$) and women with multiple falls ($p < 0.001$). The age of women with one fall versus age in the subgroup with multiple falls did not differ significantly.

Table I. *Clinical characteristics of the studied population*
Tabela I. *Charakterystyka kliniczna badanej grupy*

Parameter	Whole group (n = 978)	Women without falls (n = 650)	Women with falls (n = 328)
Age (years)	65.87 ± 7.63	65.2 ± 7.5*	67.2 ± 7.7
Height [cm]	155.97 ± 6.0	156.3 ± 5.8**	155.4 ± 6.2
Weight [kg]	74.3 ± 13.8	73.8 ± 13.7	75.2 ± 14.0
BMI [kg/m²]	30.54 ± 5.4	30.2 ± 5.4***	31.1 ± 5.4
Age of menopause (years)	49.13 ± 4.90	49.41 ± 4.55****	48.59 ± 5.52

*significantly younger than women with falls, $p < 0.0001$; **significantly taller than women with falls, $p < 0.05$; ***significantly lower BMI than in women with falls, $p < 0.05$; ****significantly later than in women with falls, $p < 0.05$

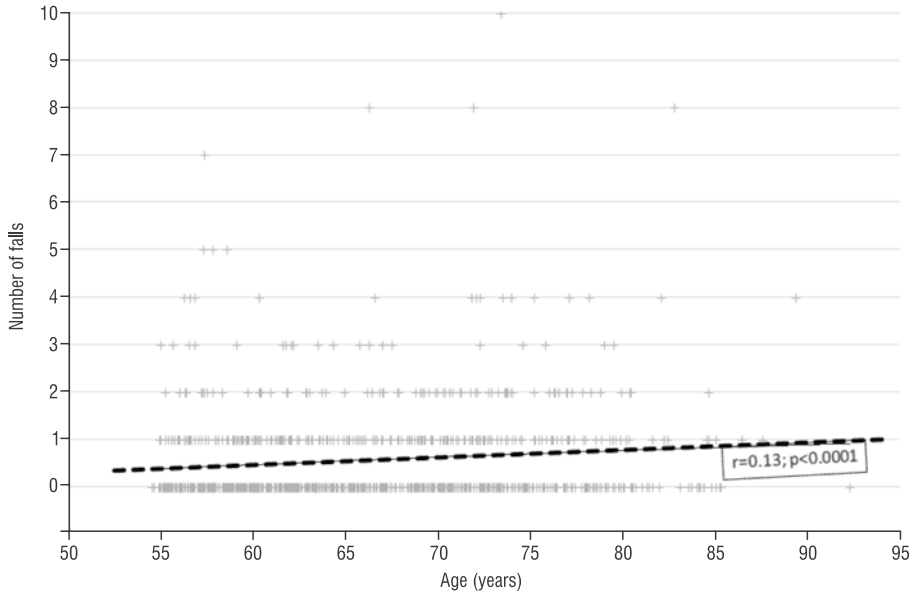

Figure 1. *Correlation between number of falls and age in the studied women*
Rycina 1. *Korelacja pomiędzy liczbą upadków a wiekiem badanych kobiet*

The falls rate was not dependant on weight or height, but weak, significant correlation with body mass index (BMI) was noted ($r = 0.076$, $p < 0.05$). The number of falls ranged from one (in 210 women) to 10 (in one woman). Figure 2 presents these data.

A relation between falls and prior osteoporotic fracture was found. Falls were reported by 40.9% of 286 women with previous fracture, which was significantly more often than in women without fracture (30.4%), as was shown by Chi-square test (10.05; $df = 1$; $p < 0.01$). This difference remains significant also after adjustment for age in ANCOVA analysis with age as a covariate ($p < 0.05$).

The influence of place of inhabitancy (urban or rural area) on falls occurrence was checked as well. Falls were less often among women from the city of Raciborz; in 618 women there were 184 subjects (29.8%) with falls. In 360 women from the rural cohort there were 143 study participants (39.7%) with falls. This difference is statistically significant in Chi-square test (10.00; $df = 1$; $p < 0.01$) and remains significant also after adjustment for age in ANCOVA analysis with age as a covariate ($p < 0.01$). Interestingly, the higher incidence of falls in the rural area did not result in higher frequency of fractures. The percentage of women with fracture from Raciborz was 29%, whereas in women from the rural cohort it was 30%, which makes an insignificant difference ($p = 0.70$).

We also analysed if other social factors, e.g. level of education, marital status, kind of job, and vitamin D administration, play a role in falls occurrence, and these factors did not influence falls rate (data not shown).

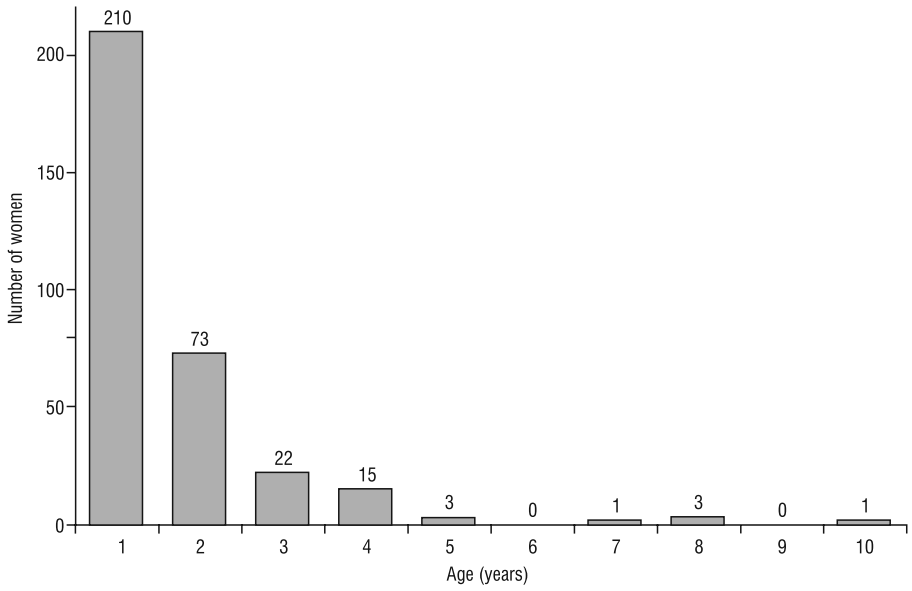

Figure 2. *Number of women in consecutive falls number categories*
Rycina 2. *Liczba kobiet w podziale na podgrupy skategoryzowane według liczby upadków*

An analysis of the influence of other potential factors on falls rate was performed as well. The role of smoking, taking of anticonvulsants or steroids, diagnosis of rheumatoid arthritis, diabetes type 1 or 2, bronchial asthma, renal failure, and depression was verified. After adjustment for age diabetes type 1 ($p < 0.001$), renal failure ($p < 0.05$), bronchial asthma ($p < 0.01$), and depression ($p < 0.001$) revealed a significant influence on falls occurrence.

To verify the parallel influence of factors identified as significant in univariate analyses on fracture occurrence, a multivariate analysis by logistic regression method was finally performed. As was shown by logistic regression, age, rural stay, prior fracture, diabetes type 1, bronchial asthma, and depression increased the chance of fall with respective Odds Ratio (OR): 1.03 (1.01–1.05), 1.65 (1.24–2.19), 1.47 (1.09–1.98), 3.47 (1.64–7.33), 2.11 (1.3–3.43), and 1.83 (1.3–2.56). The cumulative number of above-mentioned risk factors correlated positively with the number of falls ($r = 0.22$, $p < 0.0001$).

Discussion

In the current study we have shown that falls play a significant role as risk factor for fractures, and falls incidence increases with ageing. This observation was expected, but additionally we analysed the importance of several other circumstances with a potential impact on falls prevalence. We consider that the observation that falls might be caused by several other factors, e.g. rural stay, diabetes type 1, bronchial asthma, and depression, is important for practitioners. Also, the information that the number of revealed risk factors for falls present in an individual patient increases the number of falls may be easily used in daily clinical practice. Our current observations are consistent with the results given by Campbell et al. [11] that a single identifiable major factor accounts for up to 20% of falls. It means that proper patient management should include several data in order to estimate the risk for falls. Our result that the increased number of risk factors for falls increases the number of falls is concordant with the observation by Tinetti et al. [12].

Risk factors for falls were assessed in several studies, and their authors gave some proposals for preventive steps [3, 13–15]. A long list of risk factors for falls was present in those studies, and some of them were the same as in our study. The American and British Geriatric Societies recommend that all adults older than 65 years of age should be screened annually for a history of falls or balance impairment [13]. The U.S. preventive services task force recommendation statement includes risk assessment of falls [15]. According to these recommendations, primary care clinicians can consider the following factors to identify older adults at increased risk for falls: a history of falls, a history of mobility problems, and poor performance on the timed Get-up and Go test [15]. In the current study we attempted to identify risk factors for falls, and creating of comprehensive program of intervention was not our aim, but risk factors for falls identified in our study may easily be used in assessment of fall risk in the female population.

It is obvious that the propensity to fall is multifactorial, and falls are consequences of affected functional

status. In our previous study we revealed that falls and fractures were dependent on functional status expressed by the result of Get-up and Go test as well with Activity of Daily Living (ADL) [7]. One should take into consideration that such tests of functional status are not commonly applied, and generally in daily practice functional status is not established. Some factors with a significant influence on falls occurrence observed in our study, e.g. diabetes type 1, bronchial asthma, or depression probably increase the risk for falls due to their influence on some aspects of widely understood functional status.

We are not aware of data provided by other authors on falls rates in regard to rural or urban stay. The significantly higher falls occurrence in the rural population cannot be easily explained. Interestingly, the percentage of women with fracture in rural and urban population did not differ despite the difference in falls rate. One may assume that the relative role of falls as a fracture risk factor among women of mean age 65 years is not so important.

In some studies vitamin D reduced the risk for falls and fractures [16, 17], but in our study we did not confirm a preventive role of vitamin D administration. We were not able to establish the exact vitamin D dose, so we can only suspect that our negative result may be connected with its low dose. In a group of 407 women observed for a period of 5.5 years a history of fall after the age of 45 years increased the risk of fracture 8.56 fold [18]. This observation supports the necessity of gathering information on falls not only in the last year but also in the whole adult life. We are conducting a follow-up of women from the RAC-OST-POL study and in the future we will show the results of longitudinal observation in regard to falls and fractures.

The current study has some limitations. The daily dose of some medications, including vitamin D and steroids, were not established, which might have been responsible for not detecting the preventive role of vitamin D and the negative influence of steroids on the number of falls. In a questionnaire we were not able to estimate the severity of some diseases, and maybe this is why the stage of some diseases, like rheumatoid arthritis, did not interfere with falls occurrence.

Concluding, falls are common among postmenopausal women, and their occurrence is modified by several factors including age, place of stay, and some diseases. Such data should be used in daily practice in order to enhance the quality of patient management.

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