FALLS IN OLDER PEOPLE: MULTIFACTORIAL RISK ASSESSMENT AND OUTCOMES

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Background: Falls, as a geriatric sindrome, is one of most recognized public health problems and one of the biggest reasons for hospitalization, morbidity and mortality among elderly people. Risk factors of falling include involutional changes, multimorbidity, polypharmacy, and environment. Falls in older people can lead to irreversible health and social consequences, and to cause large economic burden. However, serious and less easily quantifiable are psychological outcomes, such as fear of falling, effects on confidence and personal independence.
Purpose: The purpose of our study was to investigate falls in elderly people: to analyze incidence of falls, associations of different risk factors, and also to evaluate medical and economical outcomes.
Materials and methods: Elderly people, citizens of Vilnius district (Lithuania), were recruited to our study if they were independently mobile and their Mini-mental state examination (MMSE) score was ≥21. Demographic data, data on fall history, consequences of falls, medication use, and chronic diseases were collected using the specially prepared questionnaire. The interview was conducted by trained interviewers. Subjects were assigned to a "fallers" if they reported one or more falls within the past 12 months. Physical activity was assessed by Physical Activity Scale for the Elderly (PASE) questionnaire. Fear of falling was evaluated using short version of the Falls Efficacy Scale-International (Short FES-I). Timed Up and Go (TUG) test was used to evaluate risk of falling. Short Physical Performance Battery (SPPB) test, Tinetti test, and Dynamic Gait index (DGI) were used to evaluate physical functions. Using 6 inertial sensors attached to the shins, thighs and feet, such parameters as gait speed, stride, stance time, swing, double support time, and cadence were evaluated.
Results: Analysis of data was performed in few different aspects according to aim of research and tests used. Associations of physical activity with risk and fear of falling was analysed in community-dwelling elderly people aged over 65 years. Of all 94 study subjects, 54.2% had experienced falls. They more often stated they feel fair of falling, depression or anxiety than non-fallers. The negative correlation between risk of falling and physical activity (r=-0.47; p<0,001) was found. No statistically significantly relationship was found between fear of falling and physical activity. Then two age groups were compared – under 75 years (n=53, mean age 69.4±3.2 years) and over 75 years (n=41, mean age 79.6±3.6 years). Falls during previous 12 months were reported by 100% subjects in the older and by 39.6% – in the younger age group. The correlation between fear of falling and risk of falling was weak in younger and moderate – in older group (r=0.37; p<0.001 and r=0.43; p<0.01, respectively). Physical activity was negatively associated with risk of falling in respondents aged 75 years and over (r=-0.52; p<0.001). Other sub-sample included residents of Vilnius nursing (residential care) homes, and the purpose was to investigate relationships between physical activity, fear of falling and fall risk in institutionalized elderly persons. In total, data of 113 subjects (37 men and 76 women) with a mean age of 80.2±9.7 were analyzed. Falls in the past 12 months were experienced by 66.4% of subjects. PASE score was significantly (p=0.02) higher in non-fallers than in fallers (34.0±28.4 and 24.6±27.5, respectively). It was found that FES-I score was significantly (p=0.01) lower in non-fallers than in fallers (32.7±12.0 and 38.8±12.6, respectively). The risk of falling (mean TUG test time) did not differ significantly between fallers and non-fallers. Weak negative correlation was found between scores of PASE and FES-I (r=-0.24; p=0.009) and also between scores of PASE and TUG test (r=-0.35; p=0.0001); moderate correlation was revealed between fear of falling and risk of falling (r=0.43; p<0.001).
In order to investigate the falls relationship with usage of medication and presence of chronic diseases, data of 310 community-dwelling women who had fallen in previous 12 months, were analyzed. Average age of this group was 72.7±4.95 years. Of all women, 270 (87.1%) were taking medications, most commonly – antihypertensive (50.3%, n=156). The average amount of medications consumed was 1.24 (min. 0, max. 4). Majority (74.8%) of women had reported one or more chronic diseases; most common was hypertension (51%). Women who were consuming medications, had experienced more falls compared to those who were not using any medication (1.7±1.31 and 3±0.7 respectively; p=0.015). No statistically significant correlation was found between number of falls and number of diseases or medications.
Gait parameters were evaluated in 112 subjects (73 women and 39 men) with average age 75±8.7 years, who were divided into two groups. Subjects with TUG time >14 sec. (n=35) were identified as having high risk of falling (HRF), and those with TUG test <14 sec. (n=72) – as having low risk of falling (LRF). Negative correlations of TUG were found with scores of SPPB (r=-0.62, p<0.005), BERG (r=-0.66, p<0.05), and DGI (r=-0.57, p<0.05) tests. TUG test time also statistically significantly (p<0.05) correlated with most of gait parameters: gait velocity (r=-0.7) and time (r=0.73), both legs stance (right leg r=0.49, left leg r=44) and stride time (r=0.4 and r=0.38, respectively), double support time (r=0.44), cadence (r=-0.46), and step time (r=0.4).
Relation of falls to sarcopenia was analysed in 246 community-dwelling older adults: 87 men and 159 women (mean age 79.3±6.5 years), 58.5% of persons were fallers. Sarcopenia was diagnosed in 79 (32.1%) subjects according to European

Working Group on Sarcopenia in Older People criteria made in 2018 (EWGSOP2). Logistic regression analysis confirmed that higher number of falls was associated with sarcopenia (OR: 0.11 (0.05-0.27).

The outcomes and direct medical care costs for falls were analysed in 878 community-dwelling women (65-90 years old), with mean age of 72.2±4.8 years. Self-reported falls during past 12 months were reported by 310 (35.3%) women, one in seven women had fallen twice or more. Women over 75 years fell more frequently than younger ones (p=0.02). Fear of falling was reported by 72.9% of all women who experienced fall during the previous year. Of all 407 falls, 90.3% resulted in various injuries, and 77 (18.9%) falls – in bone fractures. There were 41 (53.2%) forearm fractures, 7 (9.1%) vertebral fractures, and 6 (7.8%) hip fractures reported. Fear of falling was reported by all women with hip or vertebral fractures and by 90.2% of women with wrist fracture. Due to the fall consequences, 115 women (37.1%) visited an outpatient clinic, 15 (4.8%) were hospitalised. All those who suffered hip or vertebral fractures, were feeling fear of falling and have consequently limited their everyday activities.

The cost of health care due to fall was estimated after calculating the sum of costs for all out-patient visits, procedures or hospitalizations, excluding the cost of medication and medical equipment. The mean estimated direct health care cost was 194 EUR for the fall with non-fracture injuries, 2571 EUR – with hip fracture, 219 EUR – for fall with a forearm fracture.

Conclusions: In older people, falls and risk of falling was associated with ageing, low physical activity and physical functions, gait disorders, sarcopenia, and medication usage. Fear of falling was higher in those persons who had fallen during the previous 12 months. From all the falls registered in women over 65 years, 90.3% resulted in injuries. The mean cost of direct medical care for fall related non-fracture injury was 194.08 EUR.

Disclosure: All authors state that they have no conflict of interests.

KEYWORDS: Osteoporosis; falls; fracture risk.