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ASSESSMENT OF THE RISK FOR FALLS IN THIRD-AGE PERSONS

Original research

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ABSTRACT

Introduction: Falls in the elderly population are one of the main geriatric syndromes and a clear indicator of the fragility of the elderly population. Falls are a leading cause of death and injury in the elderly, resulting in disability and immobility requiring ongoing medical care and high treatment costs. Difficulties in performing daily life activities increase with age due to decline in physical and cognitive functioning. Research objectives: To assess the ability to perform daily life activities, to analyze the risks of falling in elderly people.

Methods: 100 people over the age of 65 participated in the research. The research instruments were a questionnaire for the assessment of daily life activities - Barthel Scale / Index (BI) and a questionnaire on screening assessments for the evaluation of falls.

Results: The Barthel index shows that the majority of respondents perform daily life activities without problems. Intrinsic factors prove that the median score was 12 with an interquartile range of 7 to 15, which represents the risk of falls in people of the third age. Extrinsic risk factors for falls in people of the third age indicate a median of 4 with an interquartile range of 2 to 5, which represents the risk for falls in older people. The most influential risk factors for falling in our survey are difficulty walking upstairs, incorrect or insufficient use of orthopedic aids, feeling of instability when standing up for the first time, complaining of weakness or reduced sensation in one or the other leg, feeling of low self-confidence, instability when walking and fear from falling.

Conclusion: Analyzing the risk factors for a fall, we obtained the result that there is an evident risk for a fall. Based on the estimated risk of falling, the most influential risk factors that affect the performance of daily life activities of elderly people were singled out.

Keywords: age, aging, fall, risk factors, prevention

INTRODUCTION

Falls in the elderly population are one of the main geriatric syndromes and a clear indicator of the fragility of the elderly population. Worldwide, falls are the second leading cause of death, with a death rate of 424,000 cases per year. Given the multiple causation of falls in the elderly population, both first-time and recurrent, it is important to conduct a multifactorial fall risk assessment. Risk factors for falls are multiple and interrelated (Stipešević Rakamarić I. 2012). The elderly population usually refers to those over 65 years of age. Interesting are the data on the current share of old people, as well as future projections for the next few decades. People aged 60 and over currently make up 12.3 % of the world's population, and by 2050 that number will grow to almost 22%. This means that the number of elderly people aged 60 and over will double by 2050 and triple by 2100. According to the criteria of the United Nations and the World Health Organization, nations with a share of people over 65 years of age with a total population of more than 10% are considered very old nations (Tomek-Roksandić S. 2012).

Aging is a natural, normal and physiological phenomenon, an irreversible individual process, which progresses at different speeds and at different ages in individual people. The aging process starts from conception and lasts until death (Vuletić et al., 2018). Activities of daily living is a term used to collectively describe the basic skills needed for independent self-care, such as eating, bathing, and mobility. These activities are used as an indicator of a person's functional status (World Health Organization. 2018). These functional skills

are mastered early in life and are relatively more preserved in light of reduced cognitive functioning compared to higher level tasks (Petrović et. al., 2016). A fall is defined as an unexpected loss of balance that results in a sudden, unintentional change in body position, during which the person is on the floor or at a lower level. Age is one of the key risk factors for falls. The largest number of falls was recorded among people of the third age. Every year, 28-35% of people over the age of 65 experience a fall, and the number rises to 32-42% for people over the age of 70 (Painter et. al., 2012). The probability that a fall will occur or the risk of falling can be attributed to a personal cause, i.e. characteristics of each individual, but also the influence of the environment (Licul et. al., 2017). Biological risk factors for falls include risks related to the human body, risks associated with the normal aging process as well as the consequences of chronic, acute or palliative diseases (Ivić A et. al., 2016). Normal aging inevitably brings physical, cognitive and affective changes that can contribute to the risk of falls, including sensory, musculoskeletal, neurological and metabolic changes (Herc M et. al., 2016). In the case of elderly people, the term environment (in which they are exposed to risk) means their apartment or house, but also the garden, the area around the building, the streets they walk on every day. In such an environment, there is a risk of stumbling, slipping and losing firm footing, which causes a direct fall. In most cases, it is about tripping over carpets and other low objects, slipping on slippery surfaces, especially on wet and hard floors in the bathroom, stairs, high elements and wardrobes, which can only be reached by climbing on other objects, and all unstable and uneven surfaces. in darkened rooms (Bye et. al., 2021).

The consequences of falls in the elderly are often serious and to a large extent result in injuries, the need for hospitalization, disability, a decline in the quality of life and dependence in the implementation of activities of daily life (Painer et . al., 2012 et . Healt pub 2021). In addition to fall-related injuries, many older people have emotional problems such as loss of self-confidence, fear, and anxiety that can further limit their daily activities (Cummings et. al., 2002). Physical consequences of a fall are: fractures (especially hip or forearm), pain or discomfort, health conditions/health problems due to prolonged immobility, difficulty or inability to move independently, especially for a long period of time, unstable gait pattern. Social consequences are: loss of independence, changes in daily routine, financial costs of hospitalization, loss of social contacts due to long-term hospitalization, reduced quality of life. Psychological consequences are: frustration due to loss of independence to carry out daily activities, fear of falling again, unhappiness resulting from uncertainty and anxiety in life after a fall injury, shame due to injury and/or use of a walking aid,

loss of self-esteem due to inability to care about myself after the fall. Fractures are the most common serious injury caused by falls in the elderly. Specifically, hip, wrist, humerus, and pelvic fractures in this age group result from the combined effects of falls, osteoporosis, and other factors that increase susceptibility to injury. In Europe, the number of people over 65 years of age is expected to increase from about 68 million in 1990 to more than 133 million by 2050 (Collin et. al., 2017). Fear of falling is a constant worry about falling that ultimately limits the performance of daily activities, and is also known as post-fall syndrome, or post-fall phobia, which is defined as a fearful expectation of falling. Older people often change their gait, reduce activity , or try to use assistive devices to prevent falls. This can lead to loss of self-confidence, reduced physical and social activities/interaction, depression, loss of mobility and independence, risk of future falls and associated mortality, increased physical frailty and risk of nursing home admission. These consequences can have a negative impact on the quality of life of the elderly and the economic burden on their families/or guardians (Radić et. al., 2009).

METHODS

Participants and procedure

A cross-sectional study was conducted, using a descriptive analytical method. The research was conducted from April to July 2021 in Sarajevo. 100 people over the age of 65 participated in the research, selected using the snowball method, who voluntarily agreed to the research.

The instruments used in the research are: Questionnaire for assessment of daily life activities - Bathel Scale / Index (BI). The questionnaire consists of a general part that includes general questions about the person (name and surname, gender, date of birth) and a specialized part that consists of 10 questions with suggested answers (Mahmutović et. al., 2011).
The questionnaire on screening assessments for the evaluation of falls refers to intrinsic (internal) and extrinsic (external) risk factors for falls in elderly people (Mahmutović et. al., 2011).

Criteria for inclusion and exclusion

The criteria for inclusion in the research are persons over 65 years of age, persons of the third age who live in their own homes and are psychophysically able to fill out the questionnaire. Respondents younger than 65 years of age, who are mentally and physically unable to fill out the questionnaire, users of gerontological centres, elderly people who live outside of Sarajevo are excluded from the research.

Original research

RESULTS

The research was conducted in the area of the city of Sarajevo from April to June 2021 . It included 100 respondents over the age of 65, selected by the snowball method, mentally and physically able to fill out the questionnaire. Barte's index of daily life activities and a questionnaire for the evaluation of falls were used as research instruments.

The average age of the respondents in the sample was 74.04 ± 5.99 years, with the youngest respondent at the age of 65 and the oldest at the age of 91. The median age was 72.5 years with an interquartile range of 69.25 to 79.0 years. (Table 1).

Table 1. Age structure of the participants

	N	Mean	SD	min	max	Percentiles 25th - 50th - 75th
Age	100	74.04	5.995	65	91	69.25 - 72.50 -79.00

A review of the average Barthel Index (BI) score shows that the average was 15.34 ± 4.99 with the lowest recorded value from 0 (no problem) to 20. The median score was 17 with an interquartile range from 12 to 20, which means that most of the respondents performs daily life activities without problems. (Table 2).

Table 2. Barthel Index (BI) score

	N	Mean	SEM	SD	Min	Max	Percentiles 25th - 50th - 75th
BI	100	15.34	0.49	4.99	0	20	12.00 - 17.00 - 20.00

An overview of the average score of positive responses on the subscale A of intrinsic (internal) factors shows that the average was 11.10 ± 5.1 with the lowest recorded average value from 0 (without the presence of at least one factor) to 21. The median score was 12 with an interquartile range from 7 to 15 which represents a risk for a fall. (Table 3).

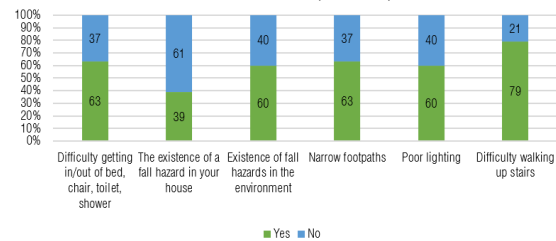Table 3. Subscale A of intrinsic (internal) risk factors for falls

Intrinsic factors	Mean	SD	Min	Max	Percentiles 25th - 50th - 75th
Subscale A	11.10	5.10	0	21	7 - 12 -15

A review of responses to questions assessing extrinsic (external) risk factors for falls shows that 63% of respondents report difficulty getting in or out of bed, a toilet seat, or a shower cubicle, 39% that there are fall hazards in their home, 60% that there is danger of falling in the surroundings, 63 that there are narrow footpaths, 60% that there is poor lighting, and 79% that it is difficult to walk up stairs. (Chart 1.).
An overview of the average score of positive responses on the subscale b of extrinsic (external) factors shows

that the average was 3.64 ± 1.91 with the lowest recorded average value from 0 (without the presence of at least one factor) to 6. The median score was 4 with an interquartile range from 2 to 5, which represents a risk for falling (Table 4).

Chart 1. Assessment of the extrinsic (external) risk factors for falls

Table 4. Subscale B of intrinsic (internal) risk factors for falls

Extrinsic factors	Mean	SD	Min	Max	Percentiles 25th - 50th - 75th
Subscale B	3.64	1.91	0	6	2 – 4 - 5

A review of the mean score of positive responses on the fall risk factor scale shows that the mean was 14.74 ± 6.61 with the lowest recorded mean from 0 (no factor present) to 27. The median score was 16 with an interquartile range of 9 to 20, which represents an evident risk for a fall. The risk factors for falls in our research are, out of a total of 100 respondents (100%), difficulty walking up stairs (79%), incorrect or insufficient use of orthopedic aids (68%), feeling unstable when standing up for the first time (66%), complaining of weakness or reduced feeling in one or the other leg (65%), a feeling of low self-confidence (63%), instability when walking (63%) and fear of falling (59%). (Table 5).

Table 5. Total score Subscale A+B risk factors for falls

Total score (Subscale A + B)	Mean	SD	Min	Max	Percentiles 25th - 50th - 75th
	14.74	6.61	0	27	9 – 16 - 20

Table 6. Comparison of the average total Barthel index

|	Sex	N	Mean	SD	Percentiles 25th	50th	75th
Total score	Male	47	15.21	5.09	11.00	18.00	20.00
	Feminine	53	15.45	4.96	14.00	17.00	19.00
	In total	100					
					Z=-0.175; p=0.861		

Comparison of the average total Barthel index shows that women had a higher average score of 15.45 ± 4.96 (M=17; Q1-Q3=14-19) compared to men with an average of 15.21±5.09 (M= 18.0; Q1-Q3=11-20). Statistical analysis using the Mann-Whitney test indicates that there is no significant difference in relation to gender (Z=-0.175; p=0.861; p>0.05).

**Graph 2.** Comparison of the average total Barthel index
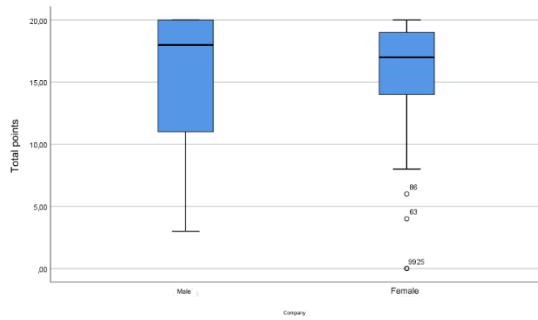
Further, we used correlation analysis to analyze the connection of the total score with the age of the subjects.

Chart 3. Correlation of subscore A and the age of the examinee
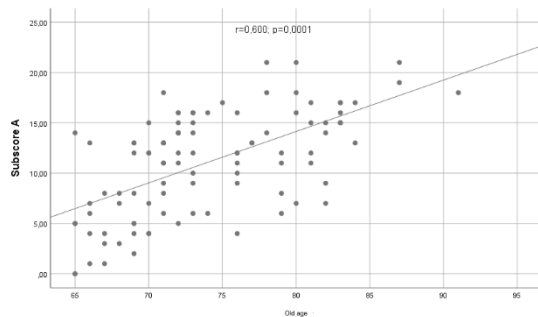
Correlation analysis of the score on subscale A - intrinsic factors shows a statistically significant moderate positive correlation (r=0.600; p=0.0001), indicating that the age of the examinee indicates the probability that the score will be higher.
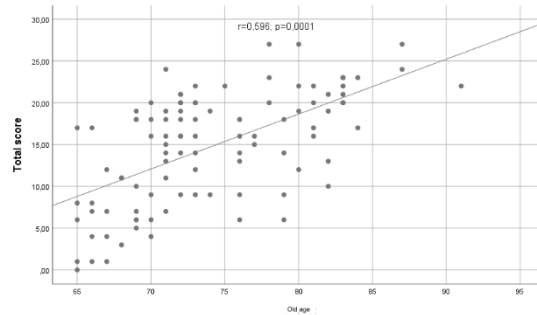
Chart 4. Correlation of subscore B and the age of the subject
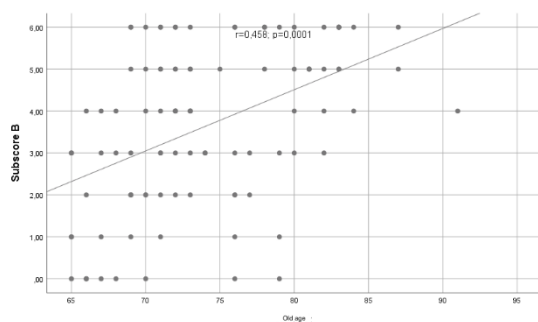
Correlation analysis of the score on the subscale B- extrinsic factors shows a statistically significant moderate positive correlation (r=0.458; p=0.0001), indicating that the older age of the examinee indicates the probability that the score will be higher.
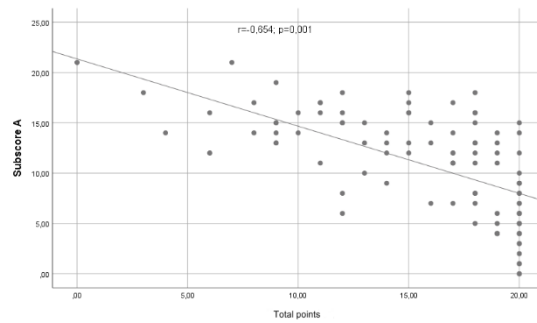
The correlation analysis of the total score shows a statistically significant moderate positive correlation (r=0.596; p=0.0001), indicating that the older age of the examinee indicates the probability that the score will be higher.

Graph 5. Correlation of the total score and the age of the examinees
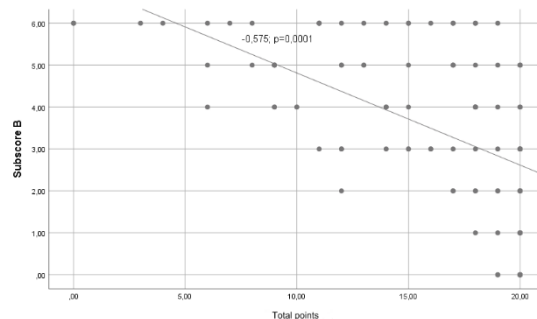

Correlation analysis of the Barthel index shows a statistically significant moderate negative correlation with the score on subscale A - intrinsic factors (r=-0.654; p=0.001), indicating that the ability to carry out daily life activities is negatively related to the occurrence of fall risk.

**Graph 6**. Correlation of BI and subscale A

Correlation analysis of the Barthel index shows a statistically significant moderate negative correlation with the score on subscale B – extrinsic factors (r=-0.575; p=0.001), indicating that the ability to carry out daily life activities is negatively related to the occurrence of fall risk.

Graph 7. Correlation of BI and subscale B

Correlation analysis of the Barthel index shows a statistically significant moderate negative correlation between the score and the total RF score (r=-0.671; p=0.001), indicating that the ability to carry out daily life activities is negatively related to the risk of falling.

Graph 8. Correlation of BI and total score (A+B)
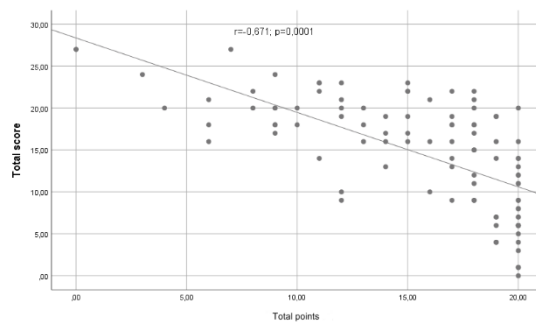
DISCUSSION

In this research, an assessment of the performance of daily activities and an analysis of risk factors for falls in people of the third age was carried out. The research was conducted in the area of the city of Sarajevo. A cross-sectional study was conducted using the Bartel index and a questionnaire on screening assessments for the evaluation of falls. 100 respondents over the age of 65 took part in the research.

2013 population census, 2,219,220 inhabitants live in the territory of the Federation of Bosnia and Herzegovina, of which 49% are men and 51% are women. About 12.9% of the population is in the age group of 65 years and older, where about 10.9% are elderly men and 14.8% are elderly women (Federation of Bosnia and Herzegovina. 2018).

The average age of the respondents in the sample was 74.04 ± 5.99 years, with the youngest respondent at the age of 65 and the oldest at the age of 91. The median age was 72.5 years with an interquartile range of 69.25 to 79.0 years.

A review of the mean Barthel index score shows that the mean was 15.34 ± 4.99 with the lowest recorded value ranging from 0 (no problem) to 20. The median score was 17 with an interquartile range of 12 to 20 which represents that most people perform without problems daily life activities. Similar data were obtained by Pérez PR (2019) in his survey of the total number of respondents (N= 374), the median of the total scores was 96.5 ± 9.4 in the range from 0 to 100 (Pérez et. al., 2019).

A review of responses to questions assessing extrinsic (external) risk factors for falls shows that 63% of respondents report difficulty getting in or out of bed, a toilet seat, or a shower cubicle, 39% that there are fall hazards in their home, 60% that there is danger of falling in the environment, 63 that there are narrow footpaths, 60% that there is poor lighting, and 79% that it is difficult to walk upstairs. As for outdoor falls, they covered only 22.4% of all falls, with the highest percentage occurring on a balcony or in a yard, they point out from Greece (Lytras et. al., 2022). Nyman et al (2013) noted that in the United Kingdom outdoor falls occurred at different times of the day and night

and in all weather conditions, although in this sample outdoor falls appeared to be slightly more common in winter and when walking on rough pavements. The predominant environmental factor that resulted in falls was uneven or poorly maintained sidewalks. They also state that for a third of outdoor falls the cause is not reported, and for a fifth the cause is reported as unknown (Neyman et. al., 2013). A large proportion of falls (over 60%) occurred at night (either before going to bed or during sleep, when the fallers got up to go to the bathroom or kitchen to get water). In the bathroom, most falls according to the event description occurred when the person entered or exited the shower (or bathtub). Less common in the bathroom were falls when sitting on and standing up from the toilet, Lytras et al reported. As for the way of falling, the respondents indicated that they most often slipped or tripped on an object, as many as 76.7% of them (Lytras et. al., 2022).

An overview of the average score of positive responses on subscale A of intrinsic (internal) factors shows that the average was 11.10 ± 5.1 with the lowest recorded average value from 0 (without the presence of at least one factor) to 21. The median score was 12 with an interquartile range from 7 to 15, which represents an evident risk for a fall. An overview of the average score of positive responses on the subscale B of extrinsic (external) factors shows that the average was 3.64 ± 1.91 with the lowest recorded average value from 0 (without the presence of at least one factor) to 6. The median score was 4 with an interquartile range from 2 to 5 which represents a risk for a fall.

Ambrose AF et al. (2016) in their research identified risk factors for falls, namely impaired balance and gait, polypharmacy and history of previous falls. Other risk factors include aging, female gender, visual impairment, cognitive decline, especially attention and executive function dysfunction, and environmental factors (Ambrosea et. al., 2016). Risk factors for falling in our research are difficulty walking upstairs, incorrect or insufficient use of orthopedic aids, feeling of instability when standing up for the first time, complaining of weakness or reduced sensation in one or the other leg, feeling of weak self-confidence, instability when walking and fear of falling. In our research, a comparison of the total score and gender of the respondents shows that women (16.19 ± 6.05) had a higher risk of falling compared to men (13.11 ± 6.89). Also, by analyzing the total score and the age of the respondents ($r=0.596; p=0.0001$), we obtained information that a higher age indicates the probability that a fall will occur. Sharif IS et al. (2018) in their research found that age ($p<0.001$) represents a risk of falling (Sharif et. al., 2018).

Drummond A. et al. (2013) in their research came to the conclusion that addiction in carrying out daily activities represents a risk for falling. Not being able to

carry out activities usually indicates changes in the mobility and autonomy of people of the third age and that it affects their self-care abilities (Drummond et. al., 2013).

CONCLUSION

By assessing the performance of daily life activities of people in the third age, the median total score was 15, which means that the majority of respondents perform daily life activities without problems. Analyzing the risk factors for falls in people of the third age, the result was obtained that there is an evident risk for falls. The most influential risk factors for falling in our survey are: difficulty walking up stairs, incorrect or insufficient use of orthopedic aids, feeling of instability when standing up for the first time, complaining of weakness or reduced sensation in one or the other leg, feeling of low self-confidence, instability when walking and fear from falling.

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Conflict of Interest

The authors do not have any conflicts of interest to disclose. All co-authors have reviewed and concurred with the manuscript's content, and no financial interests need to be reported.