ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Evaluation of risk of fractures and its connection with predictors of falls among people of over 60 years of age

Bożena Krystyna Kowalczyk[1,A-D,F], Bożena Zawadzka[2,A-C,F], Jarosław Chmielewski[2,B-D,F], Izabela Małgorzata Wróblewska[3,4,C,E-F], Maciej Janusz Żerdziński[5,B-C,F], Marek Łyp[6,C,E-F], Magdalena Florek-Łuszczki[7,E-F] ✉

[1] *Faculty of Physical Education and Security Sciences, University of Applied Sciences, Nowy Sącz, Poland*
[2] *Department of Public Health, Academy of Medical Sciences of Applied and Holistic Sciences, Warsaw, Poland*
[3] *Faculty of Health Sciences, Angelus Silesius Academy of Applied Sciences in Wałbrzych, Poland*
[4] *Faculty of Health and Physical Culture Sciences, Witelon Collegium, State University, Legnica, Poland*
[5] *Faculty of Medical Sciences, Silesian University, Katowice, Poland*
[6] *Faculty of Medical Sciences, Warsaw Medical Academy of Applied Sciences, Warsaw, Poland*
[7] *Department of Medical Anthropology, Institute of Rural Health, Lublin, Poland*
A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of the article

Kowalczyk BK, Zawadzka B, Chmielewski J, Wróblewska IM, Żerdziński MJ, Łyp M, Florek-Łuszczki M. Evaluation of risk of fractures and its connection with predictors of falls among people of over 60 years of age. Ann Agric Environ Med. doi:10.26444/aaem/218354

Abstract

Introduction and Objective. Global aging is a vital issue of public health from the medical, social and economic points of view. Together with the aging of the population, there is also a higher risk of low mineral density (BMD) especially among people over the age of sixty which indirectly leads to significantly more fractures. The aim of the study is to evaluate the connection between selected factors connected to health, and predict the risk of fractures, obtained by means of an FRAX calculator.

Materials and Method. The study was conducted on a group of 540 people aged between 60 – 74 (early old age), 75 – 89, and 75 – 89 (late old age) living at home. The Timed Up and Go (TUG) test was used to evaluate functional fitness and the risk of falls. A scale of complex everyday activities as per Lawton (IADL). Moreover, to assess the risk of fracture, a Fracture Risk Assessment Tool (FRAX) was used.

Results. Ten-year-long absolute risk of fractures as per the FRAX calculator was: on a low level – 41.85%, medium level – 36.11% and on a high level – 22.04% of the study participants. A correlation was observed between the FRAX and the number of medications taken only once ($p=0.000$), fear of falling ($p<0.001$), body mass indicator (BMI) ($p<0.001$), ability to perform complex everyday activities ($p<0.001$), falling ($p<0.001$) and hospitalization during the last 12 months, 6 medicines taken together, fear of falling, experienced in the last year.

Key words

elderly people, risk of fracture, falling, Frax calculator, IADL scale, Instrumental Activities of Daily Living Scale.

INTRODUCTION

Different European countries experience different levels of aging intensity. At the end of 2023, the number of people aged 60 or older reached the level of 26.3%, and according to a demographic prognosis its constant rise is expected, whereas the number of people above the age of 80 is going to reach its peak in 2026–2050 [1–6]. In 2060, there will be 19.9% more elderly people than in 2023. Becoming older is a natural stage in human life which does not require therapy but does requires proper care. Global aging is a crucial issue for public health from the medical, social and economic points of view. It has a significant influence on the biological changes which come with age: weakness, less resistance, worse health, worse physical and mental fitness [1–6]. There are many risk factors connected with aging, e.g. risk of falling, worse fitness, sarcopenia and bone fragility, as well as fragility in general. All are connected with the risk of fractures [7].

Fractures connected with falling are a great problem for society [8]. Falls among people over the age of 60 are considered the main epidemiological and social problems, due to serious complications caused by falls and the high risk of death [9]. Every year, about one-third of people over the age of 65 experience falls [8]. According to Najafi et al., in 5–15% of cases, a fall by an elderly person ends in a fracture [10], and according to data obtained by Ou et al., almost 90% of fractures are the result of those aged 65 or older who experience falls [8, 10].

In the United States, 20–30% of older adults who fall, suffer moderate or severe injuries. The risk of falling in older adults can result from physical, sensory and cognitive changes associated with aging. Both age and health status are factors that affect not only the risk of falling, but also the type and severity of the injuries sustained [9, 11, 12]. About 50% of people suffering from fractures will never regain the former mobility, therefore it is important to use tools

✉ Address for correspondence: Magdalena Florek-Łuszczki, Department of Medical Anthropology, Institute of Rural Health, Jaczewskiego 2, 20–090 Lublin, Poland
E-mail: magdalena.florek@wp.pl

Received: 20.01.2026; accepted: 20.02.2025; first published: 31.03.2026

for predicting fractures [4, 10]. Taking care of patients with fractures generates high social costs as well as incurring high hospital costs [7, 11, 12]. As risk factors connected to falls are the most frequent causes of fractures, evaluating the predictive factors of falling risks should be one of the main concerns in the physical evaluation of people over 60 years of age [13]. Understanding the risk of fractures in this group of people is important in order to support preventive actions, both diagnostic and therapeutic [4].

Researchers at the University of Sheffield in the United Kingdom have developed a Fracture Risk Assment (FRAX®) algorithm in order to connect clinical and radiological data, which is used to project a 10-year-long probability of a patient sustaining a fracture [14–16]. For this reason it is important to undertake all kinds of actions in order to prevent falling and fractures, because after an accidental fracture, the risk of another fracture is even higher, especially within the first two years [13]. It is also important to improve existing methods or develop new ones, which would allow identifying so-called risk groups in order to prevent fractures. Such methods are vital in order to sustain the health, quality of life and independence of elderly people [8].

The aim of the study is to check whether there is a connection between chosen health factors, including level of mobility (IADL), risk of falling (test up&go), the number of medicines taken at once, falls, fear of falling, pain intensity, hospitalization, and predictive 10-year-long absolute risk of fracture obtained by means of the FRAX among people over the age of 60.

MATERIALS AND METHOD

The selected sample material, the target group, was informed about the study through an informational and promotional campaign (leaflets, social media) organized by the researchers. Data collection took place through direct contact in the homes of the older adults. The study involved 540 people aged 60 – 74 (early old age) and 75 – 89 (late old age) living at home in the Małopolskie region in southeast Poland from March – November 2024. The criteria for selection were age 60 – 89, physical and mental conditions conducive to the study being performed at home, and consent to participate in the study. Each participant was informed about the purpose of the study, assured full anonymity and asked to give his/her consent. The participants were allowed to resign at every stage of the research without having to provide a reason. The obtained information was generalized used for investigative purposes. Anonimity was ensured by the Law of 10 May 2018 concerning the protection of personal data (Dz. U. 2018 poz.1000). Participation in the research also involved completing a questionnaire. Selection of the sample group was made with a calculator (available online at https://www.naukowiec.org/dobor.html), which showed that the number of people required for the study was 384. It was estimated that the sample of 540 at the confidence level of 95% with maximum error of 4% would be representative for this study.

The research method used was a diagnostic questionnaire in the form of a survey. Standardized tools of global geriatric evaluation were used: Timed Up and Go test (TUG) in order to evaluate functional fitness and the risk of falls, and the scale of evaluating complex everyday activities in accordance with Lawton (IADL) [17]. The Fracture Risk Assessment Tool (FRAX) was used in order to assess the risk of fracture, and socio-demographic information about the respondents was included in the questionnaire, as well as information about the risk factors for falling.

The size of somatic features was determined according to anthropometric measurements: height and body weight, both of which were measured by physiotherapists taking part in the study. Body height was determined by means of a scaled metal measure with accuracy up to 0.5 cm, performed on an accessible flat surface (wall) in the house. Body weight was assessed with digital scales with accuracy up to 1 kg, measured in the morning on an empty stomach, after morning toilet, without shoes and clothes on weighing scale (Tanita TB-350) which allowed avoiding memory error. Next, body mass index (BMI) was determined, which is defined as the relationship between body weight and the squared height (kg/m^2). According to WHO recommendation for adult European populations, the study group was divided into five subgroups – depending on BMI; underweight <18.5 kg/m^2, regular weight from 18.5 – 24.9 kg/m^2, overweight – 25.0 to 29.9 kg/m^2, obesity I° from 30 – 34.9 kg/m^2, and obesity II° from 35 – 39.9 kg/m^2 [18].

The TUG test for assessing physical fitness, walking speed, and balance, is also a good indicator of fall risk. The participants had to get up from a chair 46 cm high and placed against a wall, and cove a distance of three meters on a flat surface. Next, they had to turn around 180 degrees, return to the chair and resume the sitting position. The tasks had to be performed as fast as possible, but at a safe speed [19]. Analysis of the TUG test:
- < 10 sec – correct functional fitness; little risk of a fall;
- 10–19 sec – limited functional fitness suggesting a deeper assessment of fall risk; medium fall risk;
- ≥ 20 sec – partially limited functional fitness; high fall risk [17].

Instrumental Activities of Daily Living (IADL) is used to assess functional fitness. The participant answers 9 questions about the ability to function in the following situations: using a phone, using public transport, shopping, preparing meals, doing daily housework, DIY activities/washing, taking medicine, and managing money. Interpretation of IADL scale:
- 27–22 points – patient is independent;
- 21–17 points – patient is partially dependent on their guardian;
- 16–9 points – patient fully dependent on their guardian [20].

The Fracture Risk Assessment Tool (FRAX®) is a practical clinical tool for assessing a 10-year-long absolute risk of fractures. It is a computer algorithm accessible in 35 languages in 66 countries, including over 80% of the world population [14, 21]. In the FRAX, the following were taken into consideration: age, gender, weight, height, suffered low energetic fracture, participants' hip fracture, smoking cigarettes, taking glucocorticoids for more than three months, rheumatoid arthritis, secondary osteoporosis, taking three or more units of alcohol a day, BMD of femoral neck. If the BMD measurement is not accessible BMI (Body Mass Index) can be used [22], because of low sensitivity of BMD measurements in predicting fractures [21, 22]. FRAX is recommended by the director of Medical Technologies and Tariff Agency within

the programmes of health policy on diagnosing osteoporosis [23]. In Poland, just like in the UK, in accordance with the British version of FRAX, a 10% threshold of 10-year-risk of fracture of main bones is recommended for treatment. The FRAX algorithm used, in accordance with the authors' guidelines, was applied [14].

Statistical analysis was performed with SPSS 20 software. Data analysis included the comparison of results in different groups of study participants depending on the type of variables. In all tests, a significance level was accepted as $p<0.05$.

Ethics approval. The study protocol was approved by the Bioethics Committee of the Kraków Regional Medical Chamber (Resolution No. 121/KBL/OIL/2023) before commencement of the study. The Helsinki Declaration was adhered to regarding privacy and confidentiality of patients' data. All participants provided written consent.

RESULTS

The study group included 540 people aged 60 – 89: 75.74% women, 24.26% men, of whom 70% were in early old age, and 30% in late old age, which is in accordance with the GUS data from 1 December 2023 about the number of elderly people in Poland [23]. The average age was 70.88 ± 7.48. Seniors most often declared vocational education (42.04%), lived in villages most often (68.52%), together with a spouse (51.85%). In the case of complex life activities (IADL), 84.26% of seniors were independent. In the presented study, 77.59% of the participants declared taking at once 1 – 5 medicines. Half (50.19%) declared the level of pain as medium (VAS 4–7). Most (92.22%) participants aged 60–89 had at least one diagnosed chronic disease. Among the seniors, 42.96% were overweight and 30.18% were obese. 32.22% of the participants had at least one episode of falling in the year prior to the study. According to the TUG test, 51.85% of the elderly have a medium risk of falling, and 59.81% aged 60 – 89 were afraid of falling. Densitometric examination, which is the measurement of bone density, was perfomed in 12.41% of participants. A 10-year-long absolute risk of fractures according to FRAX® was observed on a low level – 41.85%, on medium level – 36.11%, and on high level – 22.04%. Twelve months before the research, 21.48% were hospitalized, of whom 5% because of falls. Basic data characterizing the participants is shown in Table 1.

Analysis of the research results showed that statistically significant dependence existed between the 10-year-long

Table 1. Characteristics of the participants

Variable		Research group	
		N	%
Gender	Men	131	24.26
	Women	409	75.74
Education	Primary	128	23.70
	Vocational	227	42.04
	Secondary	125	23.15
	University	60	11.11
Place of residence	City	169	31.30
	village	370	68.52
Age	60–74	378	70.00
	75–89	162	30.00
M ± SD; Me (Min.-Max.)	70.88±7.48; 70.0 (60–89)		
Marital status	single	28	5.19
	married	283	52.41
	widowed	224	41.48
	divorced	5	0.93
Running a household	alone	91	16.85
	Only with a partner	280	51.85
	With a family	56	10.37
	With a partner and children	7	1.30
BMI	underweight	5	0.93
	correct	140	25.93
	overweight	232	42.96
	obesity I gr.	116	21.48
	obesity II gr.	47	8.70
M ± SD; Me (Min.-Max.)	28.06±4.40; 27.7 (17.36–41.00)		
Result of test up&go	Not done	7	1.30
	< 10 sek.	197	36.48
	10–19 sek.	280	51.85
	≥ 20 sek.	56	10.37
M ± SD; Me (Min.-Max.)	13.03±11.98; 11.0 (5.3–20.0)		
Number of medicines taken at once	0	49	9.07
	1–5	419	77.59
	≥ 6	72	13.33
M ± SD; Me (Min.-Max.)	3.42±2.36; 3.0 (0–16)		
Falls in the last year	Yes	174	32.22
	No	366	67.78
Doing densitometric test	Yes	67	12.41
	No	473	87.59
Level of pain in VAS scale	No pain	84	15.56
	1–3	164	30.37
	4–7	271	50.19
	8–10	21	3.89
M ± SD; Me (Min.-Max.)	3.55±2.23; 4.0 (0–10)		
IADL	27–22 pkt	455	84.26
	21–17 pkt	56	10.37
	16–9 pkt	29	5.37
M ± SD; Me (Min.-Max.)	24.01±3.65; 25.0 (9–27)		
Chronic diseases	Yes	498	92.22
	No	42	7.78
FRAX®	F ≤ 5%	226	41.85
	5% < F ≤ 10%	195	36.11
	F > 10%	119	22.04
M ± SD; Me (Min.-Max.)	7.70±5.93; 6.0 (1.3–53.0)		
Fear of falling	Yes	323	59.81
	No	217	40.19
Hospitalization in the last year	Yes	116	21.48
	No	424	78.52

N – number; M – medium; SD – standard deviation; Min. – the smallest quality; Max. – the biggest quality.

absolute risk of fracture, and the number of medicines taken at once, fear of falling, body mass indicator (BMI), ability to perform complex everyday activities (IADL), and the occurrence of falls and hospitalization in the last 12 months. Among 60.42% of the participants who do not take medicines, a low 10-year-long absolute risk of falling was observed. However, among 44.44% of those who take six or more medicines at once, a high 10-year-long absolute fracture risk was observed. Over 30% of the participants who had fallen at least once in the last 12 months, a high 10-year-long absolute fracture risk was observed. A 10-year-long absolute fracture risk was observed in 28.17% of those over the age of 60 who declared fear of falling. In 58.62% who are fully dependent on their guardians, a high 10-year-long absolute risk of fracture risk was observed. Participants with II° obesity are especially prone to a low 10-year-long absolute fracture risk. Obesity resulted in a lower risk of fractures, and looked a little different in those with the correct body weight: 34% – low fracture risk, 35% – medium fracture risk, and 30% – high fracture risk. In the group of participants who had been hospitalized in the last 12 months, a statistically important connection was observed between hospitalization and the level of a 10-year-long absolute fracture risk. Among those hospitalized in the last 12 months, almost 39% had a medium, and 31% a high level of a 10-year-long absolute fracture risk at the time of being accepted for participation in the study. The level of correlation significance between variables was at $p < 0.01$ (Tab. 2).

Analyzing the results, significant correlations with Tau-b Kendall were also discovered between all the analyzed factors and those health related, i.e.: level of fitness, number of medications taken at once, fear of falling, body mass

Table 2. Correlation between factors connected to health and a 10-year-long absolute fracture risk

Variable	Index	Total		10-year-long absolute fracture risk (FRAX®)					
				low		*medium*		*high*	
		N	%	N	%	N	%	N	%
IADL	independent patient	455	100	216	47.47	160	35.16	79	17.36
	partial dependence on guardian	56	100	9	16.07	24	42.86	23	41.07
	full dependence on guardian	29	100	1	3.45	11	37.93	17	58.62
Test Chi-square 54.723; df = 4; p = **0.005**									
Test Up&Go	small risk of falling	197	100	108	54.82	71	36.04	18	9.14
	medium risk of falling	280	100	111	39.64	95	33.93	74	26.43
	high risk of falling	56	100	7	12.50	26	46.43	23	41.07
	didn't do the test	7	100	0	0.00	3	42.86	4	57.14
Test Chi-square 55.260*; df = 6; p < **0.000**									
Number of medications	no medicines	48	100	29	60.42	13	27.08	6	12.50
	≤ 5	419	100	178	42.48	160	38.19	81	19.33
	> 6	72	100	18	25.00	22	30.56	32	44.44
Test Chi-square 30.833; df = 4; p < **0.000**									
BMI	Underweight	5	100	0	0.00	1	20.00	4	80.00
	Correct	140	100	48	34.29	49	35.00	43	30.71
	overweight	232	100	89	38.36	91	39.22	52	22.41
	obesity I degree	116	100	59	50.86	42	36.21	15	12.93
	obesity II degree	47	100	30	63.83	12	25.53	5	10.64
Test Chi-square 34.401; df = 8; p < **0.000**									
Fear of falling	Yes	323	100	103	31.89	129	39.94	91	28.17
	No	217	100	123	56.68	66	30.41	28	12.90
Test Chi-square 36.059; df = 2; p < **0.000**									
Falls	yes	174	100	49	28.16	67	38.51	58	33.33
	No	366	100	177	48.36	128	34.97	61	16.67
Test Chi-square 26.771; df = 2; p < **0.000**									
Pain (VAS)	No	84	100	43	51.19	29	34.52	12	14.29
	mild (1–3)	164	100	68	41.46	63	38.41	33	20.12
	moderate (4–7)	271	100	110	40.59	91	33.58	70	25.83
	severe (8–10)	21	100	5	23.81	12	57.14	4	19.05
Test Chi-square 11.263; df = 6; p = 0.810									
Hospitalization	yes	116	100	35	30.17	45	38.79	36	31.03
	No	424	100	191	45.05	150	35.38	83	19.58
Test Chi-square 10.537; df = 2; p = **0.005**									

Legend: *25% of cells per expected population less than 5 (test result is improbable)

Table 3. Correlation between health-related factors and 10-year-long absolute fracture risk.

Variable	10-year-long absolute fracture risk (FRAX®)	
	Tau-b Kendalla	
	Correlation indicator	*Significance (p)*
TUG	0.270	**0.000**
Number of medicines taken	0.195	**0.000**
Falls	0.209	**0.000**
Fear of falling	0.243	**0.000**
Pain	0.087	**0.024**
IADL	0.289	**0.000**
BMI	-0.187	**0.000**
Hospitalization	0.132	**0.001**

index (BMI), ability to perform complex everyday activities (IADL), falling and hospitalization in the last 12 months, and 10-year-long absolute fracture risk. Of note, the body mass index (BMI) is among negatively correlating variables with 10-year-long absolute fracture risk (Tab. 3).

DISCUSSION

According to the GUS prognosis till 2050, the scale of caring needs will be higher than capabilities of providing care for dependent people reaching geriatric age. In the present and future demographic conditions, raising awareness of people is important to launch any actions with the aim of lowering elderly people's level of dependence. Aging does not require treatment, only suitable preventive and therapeutic actions, especially when aware of fracture risks and their consequences [1–6]. Falls and their consequences are the main problem in dealing with elderly adults. The first fall, whether it resulted in a fracture or not, will start a vicious circle of an even greater fear of falling, less physical activity, and less physical strength. However, the trauma of fracture decidedly strenghtens the vicious circle effect. Therefore, identifying people who may suffer from a fracture as a result of falling is especially important, because they often lose physical fitness, their social life suffers, their dependence increases, and quality of life becomes worse [25].

Clinical recommendations by many significant organizations – WHO, WFO, NICE, NOGG and ESCEO, indicate that the following examination should be carried out: densitometry examination for the early diagnosis of osteoporosis among women ≥ 65 years of age, women after menopause < 65, and men > 50 years-old [23]. Research results have shown that a significant group (87.59%) of people entitled to densitometry preventive examinations, have never undergone them; therefore, the FRAX® calculator seems to be a useful tool for predicting fracture risk. Data from the PolSenior2 and the *Health Situation 2025* reports indicate that 16.0% of the population aged 60–74 experienced a fall in the past 12 months, 26.4% of those aged 75–84, and in the group aged over 85, it was 37% [11, 26]. In the current study, 32.2% of respondents aged 60–89 experienced a fall. The results obtained by Gregori et al. [7], who examined 2,321 women at the age of 77.7 ± 1.6, the FRAX result was noted on the level 16.9 (min-11.2; max-25.0). However, the results obtained in the current study on a group of 540 women and men at the age of 70.88±7.48, the FRAX result was 7.70 (min-1.3; max-53.0). In the study by Ou et al. [27], the average FRAX results, with and without BMD, were 7.36% and 5.88%, respectively, in the case of a 10-year-long probability of osteoporosis fractures. In the current study, the average FRAX result without BMD was higher – 7.70%.

Fidecki et al. [28], on assessing the risk of falling used the TUG test, in which a high result indicates a higher risk of falling. The medium result obtained was 19.07 seconds, with the median at 15.25 seconds. In the current study, a medium result of 13.03±11.98 was obtained. The risk of falling in the research by Fidecki et al. [28] proved to be moderate – almost half of the researched people – 46.7%, and a high risk of falling referred to 25% of the researched people. In this study the risk of falling was also moderate in over half the participants – 51.85%; a high risk was also noted among 10.37% of the participants. The average result of the TUG test in the study by Zawadzka et al. [17] was almost twice as high as in the current study – 25.18 ± 9.25 seconds. Tuzun et al. [13] in a study which included 209 women aged 67.6 years, obtained statistically significant correlations ($p = 0.001$) between the FRAX and the TUG test results. Women with a high FRAX result performed the TUG test in a significantly longer time, which means they had a lower level of fitness and higher risk of falling. The results obtained in the current study are similar to the results obtained by Tuzun et al. [13]. According to the study by Kanis et al. [29] on 21,116 people aged 40 or older, with an average age of 65.7, a higher 10-year-long absolute risk of fracture was connected to a higher tendency to fall. This quotient rises along with the rise the number of reported falls [30]. Najafi et al. [10] studied 82 participants aged 54 – 89, average age 71.4 years, and reported significant correlations between the FRAX and TUG tests. The Larsson et al. [25] study assessed whether the time obtained during the TUG test was connected to the risk of fracture. 3,028 women aged 75–80 participated in the study which showed that a longer time to complete the TUG test was connected to a higher frequency of fractures ($p = 0.012$) [25]. Elderly people living at home do not always report the fact of them falling. Reports usually occur when as fall has more serious consequences than superficial injuries. Ou et al. [27] studied 1,200 people ≥ 40 years-old, in which the FRAX result of ≥ 10% was an independent factor of the risk of falling. The average FRAX result without BMD in a group of participants who suffered at least one fall in the year preceding the research was 7.10%, and in the group without any falls it was 5.58% in the case of a 10-year-long probability of serious osteoporosis fractures. In the current study a statistically significant correlation between FRAX and falling was observed on the level of $p < 0.0001$ According to Ou et al. [27], falls are a factor of fracture risk and the FRAX calculator can predicts ruptures. In the study by Najafi et al. [10], a variable which showed a statistically significant connection with a moderate to high moderate to high risk of a fracture due to a fall ($p = 0.006$). The results of the study also showed a statistically significant correlation between the analyzed variables on the level $p < 0.0001$.

Deprescribing is a serious problem in health care for the elderly. Adami et al. [30] indicated that today, as an early therapy for people with a high risk of fractures, medicines are recommended, and Kinesy therapy recommended for lower levels of risk. A study by Manias et al. [31] included 26

retrospective cohort studies in which 2,767,594 participants aged 77.1 took part, and a wrong intake of medication was significantly connected to a higher risk of falling, and a higher risk of fractures. The current study proved that patients who take 6 or more medicines at once, a 10 year-long risk of fractures connected to a higher tendency to falling is increasing, with the level of correlation significance between variables at $p<0.0001$.

The functional state of the elderly from the point of view of instrumental everyday activities (IADL), in the study by Fidecki et al. [28], was 21.08, whereas in the current study it was 24.01±3.65. The participants showed a relatively good level of functional fitness while engaged in everyday activities. However, at the same time, there was a relatively high risk of falls. Bischoff et al. [32] performed a study on 182 women aged 60 and older, and showed a strong correlation between physical capacity and the risk of fractures.. A high risk of fracture among independent people was determined in 17.36% of people, but for those fully dependent on a guardian – in 58.62% ($p<0.0001$). In the assessment by Tuzun et al. [13], the loss of body mass was not the key in the intervention programmes for improving balance to prevent falls. In the current study, a low 10-year absolute fracture risk was observed for people with II° obesity, and among the participants, obesity resulted in a lower fracture risk at $p<0.0001$. However, hospitalization may indirectly increase the risk of fractures, mainly because of body weakness and reduced physical activity. The results clearly showed that a hospital stay significantly influenced the level of a 10-year-long absolute fracture risk ($p<0.05$).

CONCLUSIONS

1) A 10-year-long absolute fracture risk for the participants, according to the FRAX calculator, was on a low level for 41.85%, medium level – 36.11% and high level – 22.04%.
2) The highest risk of a 10-year-long absolute fracture risk refers to the underweight participants who are fully dependent on their guardian, take > 6 medicines at once, and fear falling because of an experience the previous year.
3) The correlation between the FRAX result and falling proves that such factors as: hospitalization, fear of falling, and the number of medicines taken at once, may be included in the FRAX algorithm in the future.
4) A significant number (87.59%) of participants entitled to receive preventive densitometric examinations, have never undergone such an examination.

REFERENCES

1. Wróblewska ZM, Kowalczyk M, Chmielewski J. Environmental impact on quality of life in the elderly. Med Srod. 2024;27(3):103–109. https://doi.org/10.26444/ms/190832 (in Polish).
2. Kowalczyk B, Lubińska-Żądło B, Kendrová L, et al. Quality of life in seniors living in home environment in Poland and Slovakia. Ann Agric Environ Med. 2024;31(4):552–559. https://doi.org/10.26444/aaem/191690
3. Lutomski P, Kaczoruk M, Florek-Łuszczki M. Ageing policy in Poland during the COVID-19 pandemic. Ann Agric Environ Med. 2021;28(4):551–557. https://doi.org/10.26444/aaem/143559
4. Rocha VM, Gaspar HA, Oliveira CF. Fracture risk assessment in home care patients using the FRAX® tool. Einstein (Sao Paulo). 2018;6;16(3):eAO4236. https://doi.org/10.1590/S1679-45082018AO4236
5. Wróblewska Z, Chmielewski JP, Wojciechowska M, et al. The evaluation of the quality of life of older people with diabetes. Ann Agric Environ Med. 2023;30(3):505–512. https://doi.org/10.26444/aaem/168415
6. Wróblewska Z, Chmielewski JP, Florek-Łuszczki M, et al. Assessment of functional capacity of the elderly. Ann Agric Environ Med. 2023;30(1):156–163. https://doi.org/10.26444/aaem/161775
7. Gregori G, Johansson L, Axelsson KF, et al. The role of different physical function tests for the prediction of fracture risk in older women. J Cachexia Sarcopenia Muscle 2024;15:1511–1519. https://doi.org/10.1002/jcsm.13508
8. Cruz AS, Lins HC, Medeiros RVA, et al. Artificial intelligence on the identification of risk groups for osteoporosis, a general review. BioMed Eng OnLine. 2018;17:12. https://doi.org/10.1186/s12938-018-0436-1
9. World Health Organization. WHO Global report on falls prevention in older age. 2008. Available at: https://www.who.int/publications/i/item/9789241563536 (Accessed: 2026.02.10).
10. Najafi DA, Dahlberg LE, Hansson EE. A combination of clinical balance measures and FRAX® to improve identification of high-risk fallers. BMC Geriatr. 2016;16,94. https://doi.org/10.1186/s12877-016-0266-6
11. PolSenior2 – Badanie poszczególnych obszarów stanu zdrowia osób starszych, w tym jakości życia związanej ze zdrowiem. Available at: https://polsenior2.gumed.edu.pl/attachment/attachment/82370/Polsenior_2.pdf (Accessed: 2026.02.10).
12. PolSenior – Aspekty medyczne, psychologiczne, socjologiczne i ekonomiczne starzenia się ludzi w Polsce. Available at: https://pracownik.kul.pl/files/28276/public/PolSenior_monografia.pdf (Accessed: 2026.02.10).
13. Tuzun S, Akarirmak U, Kulaksiz B, et al. The association of FRAX with predictors of falls in the assessment of postmenopausal osteoporosis in Turkey: the fracture study of Turkey (FRACT study). Arch Osteoporos. 2024;20;19(1):29. https://doi.org/10.1007/s11657-024-01387-2
14. Kanis JA, Johnell O, Oden A, et al. FRAX and the assessment of fracture probability in men and women from the UK. Osteoporos Int. 2008;19(4):385–97. https://doi.org/10.1007/s00198-007-0543-5
15. Official FRAX site for branding and version details. Available at: https://www.fraxplus.org/ (Accessed: 2026.02.10).
16. Ford N, Norris SL, Hill SR. Clarifying WHO's position on the FRAX® tool for fracture prediction. Bull World Health Organ 2016;94:862. http://dx.doi.org/10.2471/BLT.16.188532
17. Zawadzka M, Kozłowska J, Ejchman-Pac E, et al. Analysis of functional efficiency and risk of falls in patients with different types of dementia – preliminary observations. Ann Agric Environ Med. 2024;31(1):114–118. https://doi.org/10.26444/aaem/168787
18. Milanese C, Itani L, Cavedon V, et al. The WHO BMI System Misclassifies Weight Status in Adults from the General Population in North Italy: A DXA-Based Assessment Study (18–98 Years). Nutrients. 2025;17(13):2162. https://doi.org/10.3390/nu17132162
19. Ortega-Bastidas P, Gómez B, Aqueveque P, et al. Instrumented Timed Up and Go Test (iTUG)—More Than Assessing Time to Predict Falls: A Systematic Review. Sensors. 2023;23(7):3426. https://doi.org/10.3390/s23073426
20. Mazur K, Pisany-Syska A. Risk factors for inpatients falls in the geriatric ward. Piel Pol. 2017;2(64):260–267. https://doi.org/10.20883/pielpol.2017.34 (in Polish)
21. Miedany IE. FRAX: re-adjust or re-think. Arch Osteoporos. 2020;15:150 https://doi.org/10.1007/s11657-020-00827-z
22. Lis-Studniarska D, Studniarski M, Zakrzewska A, et al. Determining the hierarchy of risk factors for low-energy fractures in patients of an Osteoporosis Treatment Clinic. Ann Agric Environ Med. 2024;31(3):401–409. https://doi.org/10.26444/aaem/184164
23. Rekomendacja nr 9/2020 z dnia 30 listopada 2020 Prezesa Agencji Oceny Technologii Medycznych i Taryfikacji w sprawie zalecanych technologii medycznych, działań przeprowadzanych w ramach programów polityki zdrowotnej oraz warunków realizacji tych programów, dotyczących wykrywania osteoporozy. www.aotm.gov.pl (Accessed: 2025.07.11).
24. Wyszkowska D, Gabińska M, Romańska S. The situation of older people in Poland in 2023. Białystok: Central Statistical Office; 2024. p. 14–26. ISSN 2956-8358 (in Polish)
25. Larsson BAM, Johansson L, Johansson H, et al. The timed up and go test predicts fracture risk in older women independently of clinical risk factors and bone mineral density. Osteoporos Int. 2021;32(1):75–84. https://doi.org/10.1007/s00198-020-05681-w
26. Wojtyniak B, Goryński P, editor. Sytuacja zdrowotna ludności Polski i jej uwarunkowania 2025, Warszawa: NIZP PZH – PIB, 2025 Available at: https://www.pzh.gov.pl/raport-sytuacja-zdrowotna-ludnosci-polski-i-jej-uwarunkowania-2025/do-pobrania/ (Accessed: 2026.02.10).

27. Ou LC, Chang YF, Chang CS, et al. Relationship between the FRAX score and falls in community-dwelling middle-aged and elderly people. Osteoporos Sarcopenia. 2016;2(4):221–227. https://doi.org/10.1016/j.afos.2016.10.004
28. Fidecki WM, Kijowska A, Kachaniuk H, et al. Functional ability of the elderly and related factors in the Subcarpathian Region. Ann Agric Environ Med. 2025;32(2):283–287. https://doi.org/10.26444/aaem/202317
29. Kanis JA, Johansson H, Harvey NC, et al. Adjusting conventional FRAX estimates of fracture probability according to the number of prior falls in the preceding year. Osteoporos Int. 2023 Mar;34(3):479–487. https://doi.org/10.1007/s00198-022-06633-2
30. Adami G, Rossini M, Fassio A, et al. Comments on Kanis et al: algorithm for the management of patients at low, high and very high risk of osteoporotic fractures. Osteoporos Int. 2020; 31:1015. https://doi.org/10.1002/jbmr.4134
31. Manias E, Kabir MZ, Maier AB. Inappropriate medications and physical function: a systematic review. Ther Adv Drug Saf. 2021;12:20420986211030371. https://doi.org/10.1177/20420986211030371
32. Bischoff E, Popova-Belova S, Bischoff F, et al. Physical Performance of Geriatric Women and Its Impact on Fracture Risk and Bone Mineral Density Assessed with Radiofrequency Echographic Multispectrometry (REMS). Life (Basel). 2024;14(12):1579. https://doi.org/10.3390/life14121579