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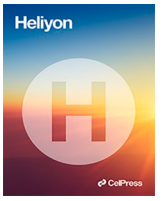

Research article

Unintentional injuries and falls in populations in Russia. The Ural eye and medical study and the Ural very old study

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A R T I C L E I N F O

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A B S T R A C T

Background: To explore the prevalence of self-reported unintentional injuries and falls (UIFs) in medium-aged and old populations in Russia and factors associated with them.
Methods: Two population-based studies (Ural Eye and Medical Study (UEMS), Ural Very Old Study (UVOS)) were carried out urban and rural areas in Bashkortostan/Russia. They consisted of 5899 individuals (age: 40+ years) and 1526 participants (age: 85+ years), respectively. We assessed previous falls as part of an interview with standardized questions, conducted in the framework of a series medical and ophthalmological assessments.
Results: In the UEMS with 5894 individuals (age:59.0 ± 10.7 years), UIF prevalence was 1101/5894 (18.7 %; 95 % confidence interval (CI)CI:17.7,19.7), with 1,2,3,4,5,6,7,8,9, or 10+ UIFs reported by 766 (69.6 %),146 (13.3 %),56 (1.4 %),15 (1.4 %),19 (1.7 %),3 (0.3 %),2 (0.2 %),1 (0.01 %), and 10 (0.9 %) participants, respectively. The UIFs had occurred as outdoor incidents (n = 594; 53.8 %), at home (n = 162; 14.7 %), on the road or traffic accidents (n = 109; 9.9 %), at work (n = 77; 7.0 %), during garden work (n = 24; 2.2 %) or as falls from a higher level (n = 17; 1.5 %) or from house roofs (n = 16; 1.4 %). In 100 (1.7 % of the total study population; 9.1 % of the group with UIFs) participants, low vision was reported as a major cause for the UIF. Higher UIF prevalence was associated (multivariable analysis) with older age (odds ratio (OR):1.01; 95% CI:1.005,1.02;$P < 0.001$), urban region of habitation (OR:1.59; 95%CI:1.37,1.85;$P = 0.001$), higher smoking package number (OR:1.01; 95%CI:1.004,1.01;$P = 0.001$), longer waist circumference (OR:1.01; 95%CI:1.002,1.01;$P = 0.008$), higher prevalence of a history of arthritis (OR:1.38; 95%CI:1.18,1.62;$P < 0.001$) and backache (OR:1.73; 95%CI:1.49,2.02;$P < 0.001$), and higher depression score (OR:1.05; 95%CI:1.03,1.07;$P < 0.001$). Out of 1525 UVOS participants (age:88.8 ± 2.9 years; range:85–103.1 years), the UIF prevalence was 780/1525 (51.1 %; 95%CI: 48.6, 53.6), with 390 (50.0 %), 116 (14.8 %), 49 (6.3 %), 12 (1.5 %), 8 (1.0 %), 2 (0.3 %), 4 (0.5

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%), 1 (0.1 %), and 15 (1.9 %) participants reported about 1,2,3,4,5,6,7,8,9,or 10+ UIFs, respectively. The UIFs had occurred as outdoor incidents (n = 386; 25.3 %), at home (n = 214; 14.0 %), on the road or traffic accidents (n = 22; 1.4 %), at work (n = 21; 1.4 %), during garden work (n = 10; 0.7 %) or as falls from a higher level (n = 11; 0.7 %) or from house roofs (n = 1; 0.1 %). A higher UIC prevalence correlated with female sex (OR:1.65; 95%CI:1.30,2.09;$P < 0.001$) and Russian ethnicity (OR:1.26; 95%CI:1.02,1.56;$P = 0.03$).
Conclusions: UIFs have occurred to a substantial part of the adult and very old population in Russia.

1. Introduction

Unintentional injuries and falls (UIFs) in adults have been a common mechanism of injury, and in particular in elderly individuals, they have been a persistent threat for mobility and risk of morbidity and mortality. Reasons for UIFs include a whole panoply of factors, including drug and alcohol consumption in relatively young individuals and frailty and comorbidities in elderly persons [1–3]. Protective measure for individuals at risk for UIFs include application of safety devices like bed alarms and traction socks in inpatient wards in hospitals, and general safety measures and legal regulations in general life. The sequels of UIFs range from unnoticeable defects to conditions of traumatic brain or spinal cord injuries. The direct sequels of UIFs in elderly individuals get further complicated and amplified by concurrent conditions such as osteoporosis, osteopenia, or usage of anticoagulant medications, to mention only a few. As shown in the Global Burden of Diseases, Injuries and Risk Factors Study (GBD) and other investigations, UIFs in adult and elderly individuals have become a major public health concern worldwide. In the GBD 2017, falls were the 18th leading cause of age-standardized rates of disability-adjusted life years in 2017 [1–3]. In the DALY (disability-adjusted life years) ranking, falls had a higher ranking position than chronic kidney disease, Alzheimer's disease and other dementias, and asthma. Within the group of unintentional injuries, falls were the second most common cause of death in the GBD 2017, after road injuries and outranking interpersonal violence and drowning.

Numerous studies have been conducted addressing the prevalence, risk factors and sequels of unintentional falls in various countries [4–15]. Despite of the importance of UIFs for public health, a comprehensive assessment of the burden of UIFs for the population in Russia, by area the world's largest country, or in Central Asia, has not been performed yet [1,2]. In particular, most of the previous studies did not specifically address a population aged 85+ years and recruited in a population-based manner. In addition, the previous studies usually did not include a large number of medical or socioeconomic parameters to search for associations between the prevalence. We therefore conducted this study to assess the prevalence of previous UIFs in a multiethnic adult and a very old study population from Bashkortostan/Russia.

2. Methods

The Ural Eye and Medical Study (UEMS) is a population-based study conducted in the city of Ufa and in a rural region in the Karmaskalinsky District in the Russian Republic of Bashkortostan from 2015 to 2017 [16,17]. All people aged 40+ years and who lived in the study areas were eligible for the study. Out of 7328 eligible people, 5899 (80.5 %) people (3319 [56.3 %] women) took part in the investigation [16,17]. The mean age was 59.0 ± 10.7 years (range: 40–94 years). The Ural Very Old Study (UVOS) is a population-based investigation which we undertook from 2017 to 2020 in similar study regions where also the UEMS was carried out [18]. The eligible individuals included the inhabitants of three private small retirement homes in the urban study region. Out of 1882 eligible people, 1525 (81 %) individuals (1136 [73.6 %] women) took part. The mean age was 88.3 ± 2.9 years (range: 85–103 years). All individuals living in the study regions and having an age of 85+years were eligible to be included into the UVOS. The populations of both studies did not vary significantly in the distribution of sex and age from the population of Russia as examined in the census performed in 2010 [19]. The Ethics Committee of the Academic Council of the Ufa Eye Research Institute (UEMS: August 25, 2015; protocol number 2; UVOS: August 10, 2017; protocol number 3) approved both studies and all participants gave an informed written consent. The details of the designs of both studies have been previously described in detail [16–18,20–22]. The questionnaire of the interview also included questions about the occurrence of falls and unintentional injuries, their number and when and in which circumstances they occurred, and whether the participants thought the UIFs had been due to low vision (Have you had a fall or several falls, and when and in which situations? Were this/these fall(s) related to bad vision? Have you been injured as a pedestrian, as a cyclist, or as a motorcyclist, or while in a car? Have you been injured from falls? Have you ever drowned? Have you been injured by fire, heat, or flammable substances? Have you ever been poisoned? Have you been injured by an explosion? Have you been traumatized by animal behavior? Have you been diagnosed (found) with a foreign body in the lung? Have you been diagnosed (found) with a foreign body in your eye? Have you been diagnosed (found) with a foreign body of others body parts?). We took into account the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER statement guidelines) [23].

Inclusion criteria for the present study were the availability of data of previous UIFs. The details of the statistical analysis have been recently described [16–18].

3. Results

The present study included 5894 (99.0 %) individuals (3315 [56.2 %] women) out of 5899 UEMS participants, with data available on previous UIFs. Their mean age was 59.0 ± 10.7 years (median: 58 years; range: 40–94 years). As compared with the group of individuals without data on previous falls, the group of study participants did not vary significantly in age ($P = 0.45$) and sex ($P = 0.39$).

The prevalence of previous UIFs was 1101/5894 (18.7 %; 95%CI: 17.7, 19.7). Out of the 1101 participants with previous UIFs, 766 (69.6 %) participants reported about one incident, 146 (13.3 %) individuals about two UIFs, and 56 (1.4 %), 15 (1.4 %), 19 (1.7 %), 3 (0.3 %), 2 (0.2 %), 1 (0.01 %), and 7 (0.9 %) participants had experienced 3, 4, 5, 6, 7, 8., 9, or 10+ UIFs, respectively. For 86 participants with UIFs, data on the number of UIFs were not available. The UIFs occurred as outdoor incidents (n = 594; 53.8 %), at home (n = 162; 14.7 %), on the road or traffic accidents (n = 109; 9.9 %), at work (n = 77; 7.0 %), during garden work (n = 24; 2.2 %), as falls from a higher level (n = 17; 1.5 %) or from the house roof (n = 16; 1.4 %), or at other occasions (n = 102; 9.3 %) (Table 1). The UIFs had occurred 13.6 ± 16.3 years (median: 5.5 years; range: 0–69 years) prior to inclusions into the study.

In 100 (1.7 % of the total study population; 9.1 % of the group with UIFs) participants, low vision was reported as a major cause for the UIF. Best-corrected visual acuity did not differ significantly between this group and the group of the remaining individuals with UIFs (−0.01 ± 0.16 logMAR (logarithm of the minimal angle of resolution) versus 0.01 ± 0.28 logMAR; $P = 0.79$).

In univariable analysis, the prevalence of previous UIFs as a cumulative variable was associated with older age (OR: 1.02; 95%CI: 1.02, 1.02; $P < 0.001$), so that for further analysis, we adjusted all analyses for age (Table 2). In that analysis, the UIF prevalence correlated with various variables including female sex, urban region of habitation, Russian ethnicity, higher smoking package years, more working hours per day, more working days spent with moderate physical activity, walking or biking for at least 10 min per day, history of low back pain, thoracic spine pain, neck pain and headache, higher prevalence of chronic obstructive pulmonary disease, and higher depression and anxiety score (Table 2).

In multivariable regression binary analysis, we dropped, due to missing statistical significance, the parameters of hip circumference ($P = 0.91$), waist-hip circumference ratio ($P = 0.93$), serum concentration of alanine transaminase ($P = 0.92$), current smoking ($P = 0.95$), prothrombin index ($P = 0.83$), prevalence of metabolic syndrome ($P = 0.80$), rod-core granulocyte percentage ($P = 0.72$), history of diarrhea ($P = 0.50$), cancer ($P = 0.52$), iron-deficiency anemia ($P = 0.46$), thoracic spine pain ($P = 0.42$), osteoarthritis ($P = 0.32$) and thyroid disease ($P = 0.56$), prevalence of chronic obstructive pulmonary disease ($P = 0.23$), history of low blood pressure with hospital admission ($P = 0.17$), prevalence of cortical cataract ($P = 0.57$), serum concentration of cholesterol ($P = 0.61$) and creatinine ($P = 0.29$), intake of food containing grains ($P = 0.23$), history of cardiovascular disease ($P = 0.14$) and arterial hypertension ($P = 0.19$), prevalence of diabetic retinopathy ($P = 0.34$), anxiety score ($P = 0.26$), ethnicity ($P = 0.31$), sex ($P = 0.60$), walking or using a bicycle for at least 10 min per day ($P = 0.47$), history of angina pectoris ($P = 0.13$), skin diseases ($P = 0.11$) and headache ($P = 0.17$), time spent with sitting or rec lining ($P = 0.09$), serum bilirubin concentration ($P = 0.06$), number of days with vegetable intake ($P = 0.20$), time spent with moderate to vigorous physical activity during work ($P = 0.09$), vigorous activity during leisure time ($P = 0.07$), length of the working day ($P = 0.10$), history of neck pain ($P = 0.07$), glaucoma prevalence ($P = 0.11$), international normalized

Table 1
Frequency of unintentional injuries and falls in the Ural Eye and Medical Study and in the Ural Very Old Study.

	n	Percentage of the whole study population	Percentage of the subgroup with unintentional injuries or falls
Ural Eye and Medical Study			
No unintentional injuries or falls	4789	81.3	–
Outdoor incident	594	10.1	53.8
House or home incident	162	2.7	14.7
Road or street incident	109	1.9	9.9
Work accident	77	1.4	7.0
Garden accident	24	0.4	2.2
Falling from a higher level	17	0.3	1.5
Falling from the house roof	16	0.3	1.4
Sport accident	15	0.3	1.4
Falling from Horse	5	0.1	0.5
Miscellaneous	82	1.4	7.4
Total	5894	100.0	
Ural Very Old Study			
No unintentional injuries or falls	745	48.9	–
Outdoor incident	386	25.3	49.5
House or home incident	214	14.0	27.4
Road or street incident	22	1.4	2.8
Work accident	21	1.4	2.7
Garden accident	10	0.7	1.3
Falling from a higher level	11	0.7	1.4
Falling from the house roof	1	0.1	0.1
Sport accident	1	0.1	0.1
Falling from Horse	1	0.1	0.1
Miscellaneous	113	7.4	14.5
Total	1525	100.0	100.0

Table 2
Associations between the prevalence of previous unintentional injuries and falls and other parameters in the Ural Eye and Medical Study with adjustment for age.

	Odds ratio	95 % Confidence interval of the odds ratio	*P*-Value
(Age (years)	1.02	1.01, 1.02	<0.001
Sex (men/women)	1.21	1.06, 1.38	0.005
Region of habitation (rural/urban)	1.39	1.22, 1.59	<0.001
Ethnicity (non-Russian/Russian)	1.52	1.30, 1.77	<0.001
Body height (cm)	0.99	0.99, 1.00	0.15
Body weight (kg)	1.00	0.99, 1.01	0.67
Body mass index (kg/m^2)	1.01	0.995, 1.02	0.21
Waist circumference (cm)	1.01	1.00, 1.01	0.005
Hip circumference (cm)	1.009	1.004, 1.01	0.001
Waist/hip circumference ratio	0.57	0.27, 1.19	0.14
Waist/height ratio	2.69	1.21, 5.98	0.02
Level of education (1–8)	1.03	0.98, 1.08	0.28
Socioeconomic score	1.02	0.98, 1.07	0.38
Smoking, currently (no/yes)	1.27	1.04, 1.54	0.02
Smoking package years	1.01	1.004, 1.02	<0.001
Alcohol consumption, any (no/yes)	0.95	0.81, 1.13	0.57
Number of daily meals	1.05	0.96, 1.14	0.29
In a week, how many days do you eat fruits?	0.92	0.89, 0.95	<0.001
In a week, how many days do you eat vegetables?	0.89	0.86, 0.93	<0.001
Type of oil for cooking used: vegetable cooking oil – animal fat (butter)	1.13	0.88, 1.44	0.33
Food containing whole grains (no/yes)	0.64	0.54, 0.74	<0.001
Salt consumed per day (g)	1.08	1.05, 1.11	<0.001
Degree of processing meat (weak – medium – strong)	0.90	0.79, 1.02	0.09
Length of working day (hours)	1.00	1.00, 1.01	0.003
Do you mostly sit and walk less than 10 min (no/yes)	0.92	0.79, 1.08	0.30
Work with moderate to vigorous physical activity (no/yes)	1.06	0.92, 1.23	0.42
How many days per week with vigorous physical work	0.94	0.89, 1.003	0.06
How much time spent with vigorous physical work per day	1.00	1.00, 1.00	0.29
Work with moderate physical activity (no/yes)	0.98	0.84, 1.15	0.81
How many days per week with moderate physical activity at work	0.89	0.84, 0.94	<0.001
How much time spent with moderate physical activity at work per day	1.000	0.999, 1.000	0.04
Walking or biking for at least 10 min per day (no/yes)	1.61	1.27, 2.04	<0.001
How many days per week with walking or biking for at least 10 min per day	0.96	0.92, 1.01	0.10
How much time spent in a car per day	1.00	0.999, 1.00	0.22
Recreation and leisure time spent mostly with sitting (no/yes)	1.11	0.96, 1.27	0.16
Does your (recreation, sport or leisure time) involve mostly sitting, reclining or standing activities, with no physical activity lasting more than 10 min at a time?	1.11	0.96, 1.27	0.16
In your leisure time, do you do any physically vigorous activities like running, strenuous sports or weight lifting for at least 10 min at a time? (no/yes)	0.80	0.69, 0.94	0.005
Over the past 7 days, how much time did you spend sitting or reclining on a typical day? (hours)	1.008	1.004, 1.012	<0.001
Physical activity score	0.99	0.98, 1.00	0.13
History of angina pectoris	1.79	1.46, 2.19	<0.001
History of asthma	1.22	0.84, 1.77	0.30
History of arterial hypertension	1.25	1.09, 1.43	0.002
History of arthritis	1.55	1.35, 1.79	<0.001
History of previous bone fractures	2.63	2.29, 3.02	<0.001
History of low back pain	2.10	1.82, 2.43	<0.001
History of thoracic spine pain	1.90	1.64, 2.21	<0.001
History of neck pain	1.91	1.66, 2.20	<0.001
History of headache	1.72	1.50, 1.97	<0.001
History of cancer	1.37	0.96, 1.94	0.08
History of cardiovascular disorders including stroke	1.51	1.30, 175	<0.001
History of heart attack	1.20	0.91, 1.58	0.20
History of dementia	1.59	0.79, 3.19	0.19
History of diabetes mellitus	1.16	0.93, 1.45	0.19
History of diarrhea	2.87	1.32, 6.23	<0.001
History of iron-deficiency anemia	1.69	1.30, 2.21	<0.001
History of low blood pressure and hospital admittance	2.21	1.65, 2.96	<0.001
History of osteoarthritis	1.32	1.12, 1.56	<0.001
History of skin disease	1.78	1.36, 2.31	<0.001
History of thyroid disease	1.33	1.09, 1.63	0.005
History of unconsciousness	4.05	3.34, 4.91	<0.001
History of menopause	1.21	0.89, 1.64	0.23
Age of the last regular menstrual bleeding (years)	0.99	0.97, 1.01	0.40
Age of last menstrual bleeding (years)	1.0	0.98, 1.02	0.89
Alanine aminotransferase (IU/L)	1.01	1.001, 1.011	0.02

(*continued on next page*)

Table 2 (*continued*)

	Odds ratio	95 % Confidence interval of the odds ratio	*P*-Value
Aspartate aminotransferase (IU/L)	1.003	0.998, 1.009	0.23
Aspartate aminotransferase/alanine aminotransferase ratio	0.87	0.72, 1.06	0.16
Bilirubine, total (μmol/L)	0.99	0.98, 0.997	0.007
High-density lipoproteins (mmol/L)	1.15	1.07, 1.24	<0.001
Low-density lipoproteins (mmol/L)	1.04	0.99, 1.10	0.15
Cholesterol (mmol/L)	1.08	1.04, 1.12	<0.001
Triglycerides (mmol/L)	1.07	0.98, 1.17	0.13
Rheumatoid factor (IU/mL)	1.05	0.99, 1.12	0.12
Erythrocyte sedimentation rate (mm/hour)	1.00	0.99, 1.01	0.66
Glucose (mmol/L)	1.00	0.97, 1.04	0.85
Creatinine (μmol/L)	0.996	0.993, 0.999	0.004
Estimated glomerular filtration rate (mL/min per 1.73 m^2)	1.005	1.002, 1.009	0.004
Chronic kidney disease stage	0.99	0.98, 0.99	0.002
Urea (mmol/L)	0.98	0.94, 1.03	0.50
Residual nitrogen (g/L)	0.49	0.12, 1.92	0.31
Total protein (g/L)	1.00	0.98, 1.01	0.32
International normalized ratio (INR)	0.52	0.32, 0.84	0.008
Blood clotting time (minutes)	1.04	0.92, 1.18	0.50
Prothrombin time (%)	1.01	1.001, 1.01	0.02
Hemoglobin (g/L)	1,00	0.995, 1.004	0.80
Erythrocyte count (10^6 cells/μL)	0.93	0.78, 1.11	0.42
Leukocyte cell count (10^9 cells/L)	0.97	0.92, 1.01	0.15
Rod-core granulocyte (% of leukocytes)	0.96	0.91, 1.01	0.08
Segment nuclear granulocyte (% of leukocytes)	1.00	0.99, 1.01	0.89
Eosinophil granulocytes (% of leukocytes)	1.05	0.99, 1.11	0.12
Lymphocytes (% of leukocytes)	1.00	0.99, 1.01	0.85
Monocytes (% of leukocytes)	0.99	0.96, 1.02	0.33
Prevalence of diabetes mellitus	1.04	0.85, 1.27	0.71
Anemia (serum hemoglobin concentration <140 g/L in men, <130 g/L in women)	0.89	0.76, 1.04	0.15
Blood pressure, systolic (mm Hg)	1.00	0.996, 1.002	0.56
Blood pressure, diastolic (mm Hg)	1.001	0.995, 1.007	0.72
Blood pressure, mean (mm Hg)	1.00	0.99, 1.01	0.92
Arterial hypertension (no/yes)	1.06	0.88, 1.29	0.53
Arterial hypertension, stages	1.00	0.93, 1.07	0.93
Ankle-brachial index, right	1.24	0.75, 2.06	0.40
Ankle-brachial index, left	1.14	0.69, 1.90	0.60
Prevalence of chronic obstructive pulmonary disease (no/yes)	1.87	1.48, 2.37	<0.001
Metabolic syndrome, prevalence (no/yes)	1.19	1.03, 1.37	0.02
Non-alcoholic fatty liver disease, prevalence (no/yes)	1.07	0.94, 1.22	0.33
State-Trait Anxiety Inventory	1.06	1.04, 1.07	<0.001
Depression score	1.07	1.05, 1.09	<0.001
Hearing loss score	1.01	0.999, 1.011	0.12
Visual acuity (best corrected; better eye) (LogMAR (logarithm of the minimal angle of resolution))	1.04	0.99, 1.20	0.61
Mild vision impairment in the better eye	0.95	0.65, 1.37	0.76
Moderate to severe vision impairment in the better eye	1.00	0.70, 1.45	0.99
Blindness in the better eye	1.41	0.37, 5.34	0.61
Moderate to severe vision impairment or blindness in the better eye	1.03	0.72, 1.46	0.89
Dry Eye, prevalence (no/yes)	1.29	1.02, 1.64	0.03
Ocular axial length (mm)	0.97	0.92, 1.03	0.37
Intraocular pressure (mm Hg)	1.01	0.997, 1.03	0.11
Diabetic retinopathy, prevalence	1.67	1.04, 2.68	0.03
Glaucoma (no/yes)	0.74	0.51, 1.08	0.12
Glaucomatous optic nerve damage stage (0–5)	0.92	0.79, 1.08	0.31
Open-angle glaucoma (no/yes)	0.59	0.37, 0.95	0.03
Glaucomatous optic nerve damage stage with open-angle glaucoma (0–5)	0.82	0.67, 1.01	0.06
Cataract, nuclear, presence (no/yes)	1.04	0.89, 1.22	0.60
Cataract, nuclear, stage	0.99	0.92, 1.07	0.83
Cataract, cortical, presence (no/yes)	0.81	0.66, 0.996	0.045
Cataract, cortical, stage	1.00	0.99, 1.003	0.26
Cataract, subcapsular, presence (no/yes)	0.96	0.48, 1.91	0.90
Cataract, subcapsular, degree	0.99	0.96, 1.03	0.75
Age-related macular degeneration, any	1.07	0.85, 1.36	0.55
Age-related macular degeneration, stage	0.99	0.91, 1.07	0.75

ratio (INR) ($P = 0.08$), and degree of processing meat ($P = 0.31$). In the final model, a higher UIF prevalence was associated with older age, urban region of habitation, higher smoking package number, longer waist circumference, lower number of days with fruit intake, higher self-reported salt consumption, higher prevalence of a history of arthritis, backache and unconsciousness, higher serum concentration of high-density lipoproteins, and higher depression score (Table 3). When the parameters of gender ($P = 0.10$), ethnicity (P

Table 3
Associations (multivariable analysis) between the prevalence of previous unintentional injuries and falls and other parameters in the Ural Eye and Medical Study.

	Odds ratio	95 % Confidence interval	*P*-Value
Age (years)	1.01	1.005, 1.019	0.001
Region of habitation rural/urban	1.59	1.37, 1.85	<0.001
Smoking package years	1.01	1.004, 1.014	0.001
Waist circumference	1.01	1.002, 1.013	0.008
In a week how many days do you eat fruits?	0.95	0.92, 0.98	0.004
Salt consumed per day (g)	1.09	1.06, 1.12	<0.001
History of arthritis	1.38	1.18, 1.62	<0.001
History of backache	1.73	1.49, 2.02	<0.001
History of unconsciousness	3.32	2.68, 4.11	<0.001
High-density lipoprotein serum concentration (mmol/L)	1.15	1.06, 1.24	0.001
Depression score	1.05	1.03, 1.07	<0.001

= 0.20), level of education ($P = 0.73$), best-corrected visual acuity in the better eye ($P = 0.45$), prevalence of moderate to severe vision impairment or blindness (defined by visual acuity of worse than 6/18 ($P = 0.62$), and prevalence of mild vision impairment (defined by visual acuity of worse than 6/12 to 6/18) were separately added to the list of independent variables in that model, they were not significantly correlated with the UIF prevalence.

Parallel to a higher prevalence of UIFs, a higher number of UIFs per participant correlated (multivariable linear regression analysis) with older age, urban region of habitation, higher smoking package number, longer waist circumference, higher self-reported salt consumption, higher prevalence of a history of arthritis, backache and unconsciousness, higher serum concentration of high-density lipoproteins, and higher depression score (Table 4).

Out of 1526 participants of the Ural Very Old Study, data on previous UIFs were available for 1525 (99.9 %) individuals with a mean age of 88.8 ± 2.9 years (range: 85–103.1 years). The prevalence of previous UIFs was 780/1525 (51.1 %; 95%CI: 48.6, 53.6). Out of the 780 participants with previous UIFs, 390 (50.0 %) participants reported about one incident, 116 (14.8 %) individuals about two UIFs, and 49 (6.3 %), 12 (1.5 %), 8 (1.0 %), 2 (0.3 %), 4 (0.5 %), 1 (0.1 %), and 5 (1.9 %) participants had experienced 3, 4, 5, 6, 7, 8., 9, or 10+ UIFs, respectively. For 193 participants, the number of UIFs could not exactly be assessed. The UIFs occurred as outdoor incidents (n = 386; 49.5 %), at home (n = 214; 27.4 %), on the road or traffic accidents (n = 22; 2.8 %), at work (n = 21; 2.7 %), as falls from a higher level (n = 11; 1.4 %) or from the house roof (n = 1; 0.1 %), during garden work (n = 10; 1.3 %), or at other occasions (n = 115; 14.7 %) (Table 1). The UIFs had occurred 12.3 ± 18.3 years (median: 5.0 years; range: 0–81 years) prior to inclusion into the study.

In multivariable analysis, a higher UIC prevalence correlated with female sex (OR: 1.65; 95%CI: 1.30, 2.09; $P < 0.001$), Russian ethnicity (OR: 1.26; 95%CI: 1.02, 1.56; $P = 0.03$), and history of unconsciousness (OR: 2,35; 95%CI: 1.63, 3.37; $P < 0.001$), while it was not associated with region of habitation ($P = 0.82$), age ($P = 0.79$), current smoking ($P = 0.40$), waist circumference ($P = 0.33$), number of days with fruit intake ($P = 0.62$), salt consumption ($P = 0.95$), history of arthritis ($P = 0.24$), backache ($P = 0.69$), serum concentration of high-density lipoproteins ($P = 0.72$), and depression score ($P = 0.19$).

4. Discussion

In our population-based study from Russia, the prevalence of previous UIFs in the UEMS with the younger population was 1101/5894 (18.7 %; 95 % confidence interval (CI)CI:17.7,19.7). Most of the UIFs had occurred as outdoor incidents (53.8 %), at home (14.7 %), on the road or traffic accidents (9.9 %), at work (7.0 %) or during garden work (2.2 %). In 100 (1.7 % of the total study population; 9.1 % of the group with UIFs) participants, low vision was reported as a major cause for the UIF. Higher UIF prevalence correlated with

Table 4
Associations (multivariable linear regression analysis) between the number of previous unintentional injuries and falls and other parameters in the Ural Eye and Medical Study.

	Standardized regression coefficient beta	Non-standardized regression coefficient B	95 % Confidence interval of B	*P*-Value	Variance inflation factor
Age (years)	0.04	0.003	0.001, 0.005	0.005	1.08
Region of habitation rural/urban	0.09	0.14	0.10, 0.18	<0.001	1.04
Smoking package years	0.04	0.002	0.001, 0.004	0.003	1.01
Waist circumference	0.03	0.002	0.000, 0.003	0.04	1.02
Salt consumption	0.05	0.02	0.01, 0.03	<0.001	1.01
History of arthritis	0.05	0.08	0.03, 0.13	<0.001	1.07
History of backache	0.07	0.11	0.06, 0.15	<0.001	1.07
History of unconsciousness	0.15	0.40	0.33, 0.48	<0.001	1.04
High-density lipoprotein serum concentration (mmol/L)	0.04	0.04	0.02, 0.06	0.001	1.01
Depression score	0.09	0.02	0.01, 0.02	<0.001	1.06

older age, urban region of habitation, higher smoking package number, longer waist circumference, and higher depression score. In the UVOS with the older population, the UIF prevalence was considerably higher than in the UEMS (51.1 % versus 18.7 %). The UIFs had occurred predominantly as outdoor incidents (25.3 %), at home (14.0 %), or on the road or traffic accidents (1.4 %). A higher UIC prevalence correlated with female sex and Russian ethnicity.

The significantly higher UIF prevalence in the UVOS population as compared to the UEMS population agrees with the results of the GBD 2019, describing a marked increase in the incidence of falls in older people in mainland China between 1990 and 2019, regardless of sex, age, and province [24]. It is also in agreement with the observation made in the UEMS of an association between a higher UIF prevalence and older age (Tables 2 and 3). With respect to sex, a higher UIF prevalence was associated with female sex in the UVOS, while in the younger UEMS study population, the UIF prevalence was independent of sex in the multivariable analysis. In some previous studies, sex has been found to be a risk factor for falls, while the GBD 2019 analysis for China detected significant sex-related disparities only in a higher burden of falls in men for the age group of 60–64 years with respect to mortality, and sex-related differences in a higher incidence rate of falls in men aged 70+ years for the period from 1990 to 2019 [24–26].

In previous studies, the risk factors for UIFs varied between the age groups [1–15,25,27,28]. In these studies, falls occurring to individuals younger than 70 years were predominantly associated with extrinsic factors, such as inappropriate footwear, insufficient lighting, and slippery floors. In older people, particularly in those with an age of 80+ years, falls were often due to decreased intrinsic capacities and functional abilities as a sequel of somatic and psychological health issues, like sarcopenia, osteoporosis, multimorbidity, and frailty [25,27,29,30]. Accordingly in the population of the UEMS, the UIF prevalence correlated with parameters such as a higher number of smoking package years, higher waist circumference, higher prevalence of arthritis and backache, and a higher depression score, all of which directly or indirectly point at a higher morbidity of the individuals.

When the observations made in our study are discussed, the limitation of our investigation should be considered. First, due to the design of the study, we did not assess the incidence of UIFs but we examined the prevalence of self-reported previous UIFs. It led to the exclusion of fatal UIFs and depended on the memory of the study participants. Since, however, major UIFs usually have a major impact, it may have been unlikely that at least major UIFs were forgotten and not reported. In a similar manner, although we asked for the timeframe in which the falls hat occurred, the individuals might not have correctly remembered the time. Second, the questions had not been taken from a validated standardized questionnaire. Third, the participation rate in the UEMS was 5899 (80.5 %) out of 7328 eligible individuals, and in the UVOS 1525 (81 %) persons out of 1882 eligible individuals participated. In both studies, about one out of 5 eligible persons did not participate, so that an inclusion bias might have bene possible. In view of the age of the participants in the case of the UVOS, and in view of the relatively high participation rate of roughly 80 %, a major bias might have been unlikely. Fourth, the study had a cross-sectional design, so that it could assess associations between the UIF prevalence and other parameters, while it could explore risk factors for UIFs. Fifth, the collected data on UIFs were self-reported, so that they might have been prone to overestimation or underestimation, particularly in the older population of the UVOS. In view of the lack of official statistical registries on UIFs, in particular if the UIFs had occurred in the private sector and had not led to a hospital admission, the assessment of self-reported information may still have been the best available method. Sixth, despite its relatively large sample size, the study's findings should be interpreted with caution due to the limitations that the assessment of the main outcome parameters was based on self-reporting. Strengths of the project were that it included a very old population in the UVOS with a minimal age of 85 years, and that it provided population-based data about the UIF prevalence in Russia, a region for which detailed information about the UIF prevalence had not been available yet.

In conclusion, a substantial part of the adult and very old population in Russia have experienced UIFs, a higher prevalence of which was associated with determinants such as older age, urban region of habitation, more smoking, longer waist circumference, and a higher depression score.

Data availability statement

The data of this study are available upon reasonable request from the corresponding author.

CRediT authorship contribution statement

Mukharram M. Bikbov: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – review & editing. **Gyulli M. Kazakbaeva:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – review & editing. **Timur R. Gilmanshin:** Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – review & editing. **Rinat M. Zainullin:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Ellina M. Iakupova:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Songhomitra Panda-Jonas:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Albina A. Fakhretdinova:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Azaliia M. Tuliakova:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Leisan I. Gilemzianova:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Dinar A. Khakimov:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Liana A. Miniazeva:** Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – review & editing. **Jost B. Jonas:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e31348.

References

[1] GBD 2019 Risk Factors Collaborators, Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019, Lancet 396 (2020) 1223–1249.
[2] GBD 2019 Diseases and Injuries Collaborators, Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019, Lancet 396 (2020) 1204–1222.
[3] S.L. James, L.R. Lucchesi, C. Bisignano, C.D. Castle, Z.V. Dingels, J.T. Fox, et al., The global burden of falls: global, regional and national estimates of morbidity and mortality from the Global Burden of Disease Study 2017, Inj. Prev. 26 (2020) i3–i11.
[4] P. Scuffham, S. Chaplin, R. Legood, Incidence and costs of unintentional falls in older people in the United Kingdom, J. Epidemiol. Community Health 57 (2003) 740–744.
[5] K.E. Ensrud, S.K. Ewing, B.C. Taylor, H.A. Fink, P.M. Cawthon, K.L. Stone, et al., Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women, Arch. Intern. Med. 168 (2008) 382–389.
[6] A. Chandran, A.A. Hyder, C. Peek-Asa, Global burden of unintentional injuries and an agenda for progress, Epidemiol. Rev. 32 (2010) 110–120.
[7] J. Jagnoor, W. Suraweera, L. Keay, R.Q. Ivers, J.S. Thakur, G. Gururaj, et al., Childhood and adult mortality from unintentional falls in India, Bull. World Health Organ. 89 (2011) 733–740.
[8] H. Alamgir, S. Muazzam, M. Nasrullah, Unintentional falls mortality among elderly in the United States: time for action, Injury 43 (2012) 2065–2071.
[9] J.A. Haagsma, N. Graetz, I. Bolliger, M. Naghavi, H. Higashi, E.C. Mullany, et al., The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013, Inj. Prev. 22 (2016) 3–18.
[10] World Health Organization, Injuries and violence: the facts, 2014, Available: http://apps.who.int/iris/bitstream/handle/10665/149798/9789241508018_eng.pdf. (Accessed 10 September 2023).
[11] S.K. Verma, J.L. Willetts, H.L. Corns, H.R. Marucci-Wellman, D.A. Lombardi, T.K. Courtney, Falls and fall-related injuries among community-dwelling adults in the United States, PLoS One 11 (2016) e0150939.
[12] C.A. Taylor, J.M. Bell, M.J. Breiding, L. Xu, Traumatic brain injury-related emergency department visits, hospitalizations, and seaths - United States, 2007 and 2013, MMWR Surveill Summ 66 (2017) 1–16.
[13] L. Duan, X. Deng, Y. Wang, C. Wu, W. Jiang, S. He, et al., The national injury surveillance system in China: a six-year review, Injury 46 (2015) 572–579.
[14] A.I. Vecino-Ortiz, A. Jafri, A.A. Hyder, Effective interventions for unintentional injuries: a systematic review and mortality impact assessment among the poorest billion, Lancet Glob Health 6 (2018) e523–e534.
[15] Q.P. Nguyen, O. Saynina, E.A. Pirrotta, L.C. Huffman, N.E. Wang, A retrospective observational cohort study: epidemiology and outcomes of pediatric unintentional falls in US emergency departments, Injury 52 (2021) 2244–2250.
[16] M.M. Bikbov, T.R. Gilmanshin, G.M. Kazakbaeva, R.M. Zainullin, E.M. Rakhimova, I.A. Rusakova, et al., Prevalence of myopic maculopathy among adults in a Russian population, JAMA Netw. Open 3 (2020) e200567.
[17] M.M. Bikbov, R.R. Fayzrakhmanov, G.M. Kazakbaeva, et al., Frequency and associated factors of bone fractures in Russians: the ural eye and medical study, Sci. Rep. 8 (2018) 7483.
[18] M.M. Bikbov, G.M. Kazakbaeva, E.M. Rakhimova, I.A. Rusakova, A.A. Fakhretdinova, A.M. Tuliakova, et al., Prevalence factors associated with vision impairment and blindness among individuals 85 years and older in Russia, JAMA Netw. Open 4 (2021) e2121138.
[19] Federal State Statistic Service, Population census. https://eng.gks.ru/folder/76215. (Accessed 24 February 2022).
[20] M.F. Folstein, S.E. Folstein, P.R. McHugh, Mini-mental state. A practical method for grading the cognitive state of patients for the clinician, J. Psychiatr. Res. 12 (1975) 189–198.
[21] P.M. Lewinsohn, J.R. Seeley, R.E. Roberts, N.B. Allen, Center for Epidemiological Studies-Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults, Psychol. Aging 12 (1997) 277–287.
[22] C. Spielberger, R.L. Gorsuch, R.E. Lushene, C.D. Spielberger, R.L. Gorsuch, R.E. Lushene, Manual for the State-Trait Anxiety Inventory, Consulting Psychologists Press, Palo Alto, CA, 1970.
[23] G.A. Stevens, L. Alkema, R.E. Black, J.T. Boerma, G.S. Collins, M. Ezzati, et al., Guidelines for accurate and transparent health estimates reporting: the GATHER statement, Lancet 388 (2016) e19–e23.
[24] P. Ye, Y. Er, H. Wang, L. Fang, B. Li, R. Ivers, et al., Burden of falls among people aged 60 years and older in mainland China, 1990-2019: findings from the Global Burden of Disease Study 2019, Lancet Public Health 6 (2021) e907–e918.
[25] WHO, Step Safely: Strategies for Preventing and Managing Falls across the Life-Course, World Health Organization, Geneva, 2021.
[26] M.M. Kwan, J.C. Close, A.K. Wong, S.R. Lord, Falls incidence, risk factors, and consequences in Chinese older people: a systematic review, J. Am. Geriatr. Soc. 59 (2011) 536–543.
[27] World Report on Ageing and Health, World Health Organization, Geneva, 2015.
[28] WHO, WHO Global Report on Falls Prevention in Older Age, World Health Organization, Geneva, 2007.
[29] J. Fan, C. Yu, Y. Guo, Z. Bian, Z. Sun, L. Yang, et al., Frailty index and all-cause and cause specific mortality in Chinese adults: a prospective cohort study, Lancet Public Health 5 (2020) e650–e660.
[30] Y. Zhang, L. Zhou, S. Liu, Y. Qiao, Y. Wu, C. Ke, et al., Prevalence, correlates and outcomes of multimorbidity among the middle-aged and elderly: findings from the China Health and Retirement Longitudinal Study, Arch. Gerontol. Geriatr. 90 (2020) 104135.