The prevalence of cognitive impairment and their association with socioeconomic, demographic and anthropometric factors and geriatric syndromes in people over 65 years of age: data from the Russian epidemiological study EVKALIPT

Mkhitaryan E.A.[1], Vorobieva N.M.[1], Tkacheva O.N.[1], Kotovskaya Yu.V.[1], Koberskaya N.N.[1,2], Selezneva E.V.[3], Ovcharova L.N.[3]

[1]Russian Clinical and Research Center of Gerontology, N.I. Pirogov Russian National Research Medical University, Ministry of Health of Russia, Moscow; [2]Department of Nervous System Diseases and Neurosurgery, N.V. Sklifosovsky Institute of Clinical Medicine, I.M. Sechenov First Moscow State Medical University (Sechenov University), Ministry of Health of Russia, Moscow; [3]National Research University "Higher School of Economics", Moscow

[1]16, 1st Leonova St., Moscow 129226, Russia; [2]11, Rossolimo St., Build. 1, Moscow 119021, Russia;

[3]20, Myasnitskaya St., Moscow 101000, Russia

Cognitive dysfunction is one of the most common disorders in the elderly and senile age. There are currently 57 million people with dementia worldwide.

***Objective:** to assess cognitive functions, to understand the prevalence of cognitive impairment (CI) and to analyze their associations with socioeconomic, demographic and anthropometric factors and geriatric syndromes in people aged ≥65 years.*

***Patients and methods.** Subjects living in 11 regions of the Russian Federation took part in the EVKALIPT epidemiological study. The inclusion criterion was age ≥65 years. Participants were divided into three age groups (65–74 years, 75–84 years, and ≥85 years) according to the protocol. All patients underwent a comprehensive geriatric assessment, comprising a specially designed questionnaire and physical examination. Cognitive functions were assessed using the mini-Cog test. The study included 3545 patients (of which 30% were males) aged 65 to 107 years.*

***Results and discussion.** According to the data obtained in our study, CI was detected in 60.8% of the subjects, and severe disorders – in 19.9% (0 or 1 point according to the mini-Cog). Patients with CI had a lower socioeconomic status. One-way regression analysis showed that the risk of CI increased by 10% with increasing age for every 1 year but did not depend on the sex of the subjects. Associated with increased CI risk also were: living alone (by 28%), living in a nursing home (by 90%), widowhood (by 2.2 times) or absence of a partner (by 2.2 times), underweight (by 2.9 times) and normal body weight (by 1.6 times), disability (by 54%), primary (by 4.8 times) and secondary (by 75%) education, bad economic conditions (by 95%). On the contrary, the presence of overweight and obesity reduced the risk of CI by 14 and 24% respectively, living in a family – by 24%, having a spouse – by 55%, divorce – by 29%, having a job – by 73%, higher education and a scientific degree – by 55 and 59%, medium and good economic conditions – by 38 and 52%, respectively. In patients with CI, the incidence of all geriatric syndromes was higher.*

***Conclusion.** The frequency of CI among elderly patients was higher compared with data from other studies. The EVKALIPT study was the first to obtain national data on the prevalence and characteristics of CI in persons aged ≥65 years in the general population.*

***Keywords:** cognitive impairment; prevalence; dementia; geriatric syndromes.*
Contact:** Elena Araikovna Mkhitaryan; **melen99@mail.ru
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Cognitive impairment (CI) is a heterogeneous group of symptoms associated with various neurological, physical and mental disorders. In elderly patients, CI develops due to neurodegenerative, cerebrovascular and dysmetabolic disorders. As of 2019, there were about 57 million people in the world suffering from severe CI (dementia). Given the tendency towards population aging, the number of people with dementia is projected to increase in the coming decades and is expected to reach 152.8 million people by 2050. [1, 2] In 2019, the estimated number of patients with dementia in Russia was 1.95 million. By 2050, this figure is expected to reach 4 million. [3]

In recent years, encouraging data have appeared on the stabilization and even reduction in the number of patients with dementia in the world's major economies. In these countries, the declining prevalence of dementia is considered to be associated with improved socioeconomic factors, living conditions, and the quality of medical care, as well as healthy lifestyle campaigns. [4] CI is mostly diagnosed at a late stage (stage of dementia) when minimal help is possible.

CI is one of the leading causes of disability in elderly patients. Cognitive deficiency progression and aggravation leads to the loss of social skills, abrupt functional limitations and incapacity in patients. Age is a well-known non-modifiable risk factor of cognitive deficiency: CI is common among patients of older age groups, and their prevalence increases with age. The meta-analysis of data from countries of Western and Eastern Europe (2021) shows that among all people aged 65 years and older, the prevalence of dementia is between 5.7% and 10.1% (on average, dementia is detected in 7.1% of people over the age of 65) and progressively increases in older age groups. [1, 2] The prevalence of all non-dementia CIs in people over the age of 80 is even higher and, according to some data, reaches 40% depending on age [5] and by the age of over 90 it may even exceed this value. Considering the growing age of the population all over the world every year, the prevalence of CI is also growing. If the severity of cognitive symptoms goes beyond the age norm, this indicates that the disease is developing. [6, 7] In this case, the patient needs to be examined to identify the cause of cognitive decline. The sooner the cause is identified, the more options there are to stop the development of cognitive deficiency. Cognitive status and anthropometric measurements prove to be closely related to socioeconomic factors (people with a higher level of education, social status and higher income are at a lower risk of cognitive decline with age). [8]

The study objective is to assess cognitive functions, to understand the prevalence of CI and to analyze their association with socioeconomic, demographic and anthropometric factors and geriatric syndromes in people aged ⩾65.

Patients and methods. Subjects living in 11 regions of the Russian Federation (the Republics of Bashkortostan, Dagestan and Chuvashia, Voronezh and the Voronezh Region, Moscow, Saratov, St. Petersburg and the Leningrad Region, Ivanovo, Ryazan, Samara and Smolensk Regions) took part in the EVKALIPT epidemiological study and were examined between April 2018 and October 2019. Inclusion criteria were age ⩾65 years and written voluntary informed consent to participate in the study. Participants were divided into three age groups (65–74 years, 75–84 years, and ⩾85 years) according to the protocol.

All patients underwent a comprehensive geriatric assessment (CGA) comprising a specially designed questionnaire and physical examination.

The questionnaire included the following modules: “Socioeconomic status”, “Occupational history”, “Risk factors for chronic noncommunicable diseases”, “Chronic noncommunicable diseases”, “Drug therapy”, “Obstetrical and gynecological history”, “Falls and fall risk”, “Chronic pain”, “Sensory deficits”, “Oral conditions”, “Urinary and fecal incontinence”, “Use of assistive devices”, and “Laboratory findings”, as well as a number of standardised scales: “Age is Not a Barrier” screening scale, Geriatric Depression Scale (GDS-15), Barthel Index for Activities of Daily Living, Lawton Instrumental Activities of Daily Living, Mini Nutritional Assessment (MNA), Charlson Comorbidity Index [9], and the Visual Analogue Scale (VAS) for the self-assessment of quality of life, health status, and intensity of pain syndrome at the time of examination and within the previous 7 days.

The physical examination included: the short physical performance battery; dynamometry; gait speed test; Mini-Cog test; height and body weight, body mass index (BMI); blood pressure (BP) and heart rate (HR); tilt table test. [10, 11]

The detailed study protocol and baseline subject characteristics have been described in our previously published article. [12]

Cognitive functions were assessed using the Mini-Cog test, comprising two tasks: 1) 3-item recall test; 2) clock drawing. For the first task, from 0 to 3 points are awarded, for the second one from 0 to 2, and the points are added together. The maximum possible score is 5, the minimum possible score is 0. A score of ⩽3 indicates the presence of CI.

In addition to CI, the presence of the following geriatric syndromes (GS) was identified: frailty; depression; malnutrition; postural hypotension; urinary and fecal incontinence; functional disorders; loss of autonomy; falls (within the previous year); visual and hearing impairment; chronic pain syndrome; pressure ulcers.

Table 1. *Demographic, anthropometric and clinical characteristics of patients aged ⩾65 years (n=4308)*

Parameter	All patients (n=4308)	Age groups: 65–74 years (n=1583)	75–84 years (n=1519)	⩾85 years (n=1206)	p for trend
Age, years, M±SD	78.3±8.4	69.1±2.6	79.4±2.5	88.9±3.3	–
Male, %	29.7	31.9	27.3	29.9	**0.020**
Height, m, M±SD	1.63±0.09	1.64±0.08	1.62±0.08	1.61±0.09	**<0.001**
Body weight, kg, M±SD	73.9±14.3	78.3±14.5	73.3±13.3	68.9±13.2	**<0.001**
BMI, kg/m², M±SD	27.9±5.0	29.0±5.2	27.9±4.9	26.6±4.4	**<0.001**
Body weight, patient rate, %:					
underweight	1.3	1.0	0.9	2.2	**0.007**
normal weight	27.6	21.3	28.4	34.7	**<0.001**
overweight	40.9	41.1	39.6	42.2	0.414
obese	30.2	36.6	31.1	21.0	**<0.001**
Obesity class, patient rate, % (n=1264)					
I	72.2	66.8	75.0	78.8	**0.001**
II	21.6	24.2	20.2	18.4	0.118
III	6.3	9.0	4.8	2.8	**0.001**
Systolic BP, mmHg, M±SD	136.1±16.5	136.4±16.6	136.0±16.0	135.8±17.0	0.819
Diastolic BP, mmHg, M±SD	80.2±9.5	81.6±9.5	80.1±9.2	78.5±9.7	**<0.001**
Pulse pressure, mmHg, M±SD	55.9±13.0	54.8±12.5	55.8±12.4	57.3±14.0	**<0.001**
HR, bpm, M±SD	72.7±8.6	72.6±8.3	73.0±9.1	72.3±8.3	0.111

Subject characteristics. The study included 4308 patients (including 30% of male subjects) aged of between 65 and 107 years old (Table 1). Most (60%) of the subjects were examined in outpatient care facilities, one in five in inpatient care facilities (20%) or at home (19%), and 1% in residential care facilities/nursing homes. Among those examined, subjects who were overweight prevailed (41%), the rate of patients with obesity and normal body weight was almost the same (30% and 28%), and 1.3% of subjects were found to be underweight (see Table 1). With age, height, body weight, BMI, and the rate of obese subjects decreased, and the rate of patients with normal body weight and with bodyweight deficiency increased. The rate of overweight subjects is approximately the same in all age groups. The average systolic and diastolic BP and HR were within normal parameters in all patients, however, with age, there is also a decrease in diastolic BP and, accordingly, an increase in pulse pressure with almost the same values of systolic BP and HR.

The Mini-Cog test was performed in 3545 (82%) of 4308 subjects; 18% of the subjects were not able to complete the test due to poor vision/lack of glasses, refusal or severe CIs. *Statistical data analysis* was performed using IBM® SPSS® Statistics version 23.0 (SPSS Inc., USA). The type of distribution of quantitative variables was analysed using the one-sample Kolmogorov–Smirnov test. With parametric data distribution, the results are presented as M±SD, where M is the mean, SD is the standard deviation; with non-parametric ones, the results are presented as a median (Me) [25th; 75th percentile]. For clarity, some ordinal variables are presented both as Me [25th; 75th percentile] and M±SD. For intergroup comparisons, the Mann–Whitney, Kruskal–Wallis, Pearson's χ^2 tests and two-tailed Fisher's exact test were used. Relationships between variables were assessed using Spearman's correlation and binary logistic regression with calculation of odds ratio (OR) and 95% confidence interval (CI). Multivariate analysis was performed with adjustment for age and sex, using direct stepwise variable selection. Differences were considered statistically significant with a two-tailed p<0.05.

Based on the results of one-way analysis, variables with a significance level of p<0.05 were included in a multivariate regression analysis, and two regression models were built. In the first model, all variables were treated as binary variables (with the exception of age, which was analysed as an extended variable in both models). In the second model, body weight, level of education, and material opportunities were considered as rank variables, while the rest of the parameters were considered as binary ones.

Results. Total Mini-Cog score varied between 0 and 5 (Me [25th; 75th percentile] – 3 [2; 4]). See Fig. 1 for the distribution of subjects versus the total score. CIs were detected in 2157 (60.8%) of 3545 subjects (Mini-Cog score ⩽3). With increasing age, the prevalence of CI increased significantly (Fig. 2).

Patients with CI were on average 6 years older and had lower height, body weight and BMI respectively. Among them there were more underweight and normal-weight subjects and less overweight and obese subjects. Also, in patients with CI, pulse pressure was higher and there was a tendency to higher systolic BP.

Correlation analysis revealed a moderate negative correlation between total Mini-Cog score and age (r=-0.44; p<0.001); weak positive relationships between total Mini-Cog score and height (r=0.14; p<0.001), body weight (r=0.18; p<0.001) and BMI (r=0.12; p<0.001). Very weak correlations were also found between the sum of the Mini-Cog test scores and the level of blood pressure: a positive one for diastolic blood pressure (r=0.04; p=0.038) and a negative one for pulse pressure (r=-0.05; p=0.002).

Patients with CI had a lower socioeconomic status: thus, among them there were more widows and single people (without a partner), fewer married and divorced, they more often lived alone or in residential care facilities/nursing homes and less often in a family, they had a lower level of education, poor financial resources, they were more likely to have a disability and were less likely to continue working compared to those without CIs.

Relationships between demographic, anthropometric, socioeconomic factors and CI were studied using a one-way regression analysis, where CI should be considered as a dependent variable, and demographic, anthropometric and socioeconomic factors as independent variables. At the same time, a number of factors were analysed in two ways: both as binary and as rank variables.

One-way regression analysis showed that the risk of CI increases by 10% with increasing age for every 1 year but does not depend on the sex of the subjects. Living alone (by 28%), living in a residential care facility (by 90%), widowhood (2.2-fold) or being single (2.2-fold), underweight (2.9-fold) and normal body weight (1.6-fold), disability (by 54%), primary (4.8-fold) and secondary (by 75%) education, low financial resources (by 95%) were associated with an increased risk of CI. On the other hand, some factors were associated with a reduced risk of CI. Thus, in overweight and obese people, the risk was lower by 14 and 24%, respectively, in those living with a family — by 24%, with a spouse — by 55%, divorced — by 29%, continuing to work — by 73%, with higher education and an academic degree — by 55% and 59%, and with medium and high financial resources — by 38% and 52%, respectively. In addition, those who had previously donated blood had a risk of CI below 35%.

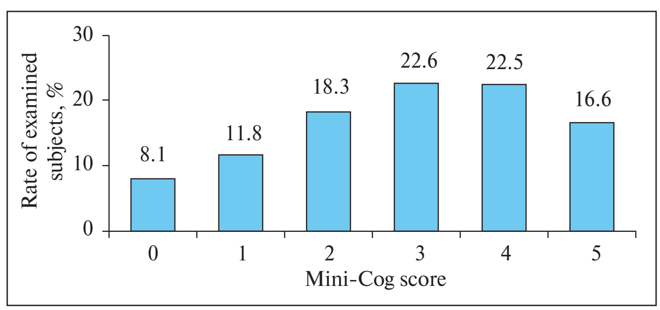

Fig. 1. *Distribution of persons aged ⩾65 years depending on the sum of mini-Cog test scores (n=3545), %*

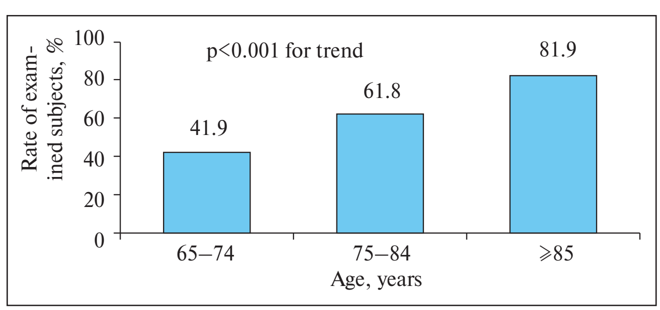

Fig. 2. *Prevalence of CI in individuals aged ⩾65 years depending on the age group (n=3545), %*

Further analysis of some variables as rank ones showed (see Table 5) that an increase in age for every 5 years is accompanied by an increase in the risk of CI by 59%, while an increase in other variables (body weight, level of education, financial resources, history of blood donation) by one rank, on the contrary, is associated with a 23–40% reduction in the risk of CI.

Multivariate analysis showed that, along with age, eight anthropometric and socioeconomic factors are independent predictors of CI in subjects at the age of ⩾65 y.o. The inclusion order of variables in the model was as follows: age, higher education, low financial resources, primary education, secondary education, BMI <25 kg/m^2, marital status, history of blood donation, continuing to work. The model sensitivity was 52.2%, and the model specificity was 80.9%. Low body weight, low and moderate levels of education, and low financial resources are associated with a 1.3–2.5-fold increase in the risk of CI, while marital status, a high level of education, a history of blood donation, and continuing to work, on the contrary, protect against CIs and are associated with 20–37% decreased probability of their presence. Primary education was the most significant risk factor for CI (OR 2.51; p<0.001).

Multivariate analysis showed that, besides age, six anthropometric and socioeconomic factors are independent predictors of CI in subjects at the age of ⩾65. The inclusion order of variables in the model was as follows: age, education, financial resources, history of blood donation, marital status, body weight, continuing to work. The model sensitivity was 51.7%, and the model specificity was 81.6%. At the same time, an increase in age for every 1 year was associated with an increase in the risk of CI by 8%, while all other predictors, including three rank variables, had a protective effect and were associated with a decrease in the risk of CI by 13–38%. For rank variables (body weight, level of education and financial resources), an increase in their value for each one rank was found to correlate with a decrease in the risk of CI by 13%, 30% and 38%, respectively.

CGA findings showed that patients with CI had lower gait speed, hand grip force, Barthel index, total Lawton Instrumental Activities of Daily Living score, total MNA score and the Short Physical Performance Battery score, and higher total GDS-15 score and "Age is Not a Barrier" score. Patients with CI had lower values of self-assessed quality of life and health status and higher values of self-assessed severity of pain at the time of examination and within the previous 7 days (Table 2).

In general, patients with CI used aids more often, and their number per patient was significantly higher than in subjects without CI (Table 3). Patients with CI were significantly more likely to use hearing aids, dentures, adult diapers, and mobility aids, but less often orthopedic devices. There were no differences in the frequency of glasses/lenses use between patients with and without CI.

Correlation analysis revealed predominantly moderate, both direct and inverse, relationships between the total Mini-Cog score and some CGA parameters (Table 4). A weak positive correlation was found between the total the Mini-Cog score and gait speed, and a weak negative correlation was found between the total Mini-Cog score and self-assessed severity of pain at the time of examination and within the previous week, and the number of aids used.

In patients with CI, the frequency of all GS was higher (Table 5), except for postural hypotension. The most common GS were chronic pain syndrome (90%), basic dependence in everyday life (72%), frailty syndrome (72%), dependence in instrumental activities of daily living (66%), probable depression (58%) and urinary incontinence (53%).

Relationships between CI and other GSs were studied using one-way regression analysis, where CI was considered as a dependent variable (Table 6). One-way analysis showed that the presence of these GSs is associated with a 1.3–5.8-fold increase in the risk of CI.

Table 2. *Results of a comprehensive geriatric assessment depending on the presence or absence of CI in people aged ⩾65 years (n=3545)*

Parameter	All patients (n=4308)	CI present (n=2157)	CI absent (n=1388)	p
"Age is Not a Barrier" screening, score	3 [1; 4]	3 [2; 4]	2 [1; 3]	<0.001
Short Physical Performance Battery, score	6 [3; 9]	5 [2; 8]	8 [5; 10]	<0.001
Hand grip force, kg:				
males	22 [16; 30]	20 [13; 28]	25 [19; 31]	<0.001
females	16 [11; 21]	13 [10; 19]	18 [14; 23]	<0.001
Decreased hand grip force, %*	70.8	77.9	62.6	<0.001
Gait speed, m/sec	0.60 [0.46; 0.83]	0.57 [0.44; 0.83]	0.67 [0.50; 0.83]	<0.001
Decreased gait speed, %*	56.1	58.1	50.7	<0.001
Barthel Index for Activities of Daily Living, score	95 [85; 100]	90 [80; 100]	100 [95; 100]	<0.001
Lawton Instrumental Activities of Daily Living score, score	7 [5; 8]	6 [4; 8]	8 [7; 8]	<0.001
MNA (screening), score	12 [10; 13]	11 [10; 13]	13 [12; 14]	<0.001
GDS-15, score	4 [2; 8]	6 [3; 9]	3 [1; 5]	<0.001
Self-assessed quality of life using VAS, score	7 [5; 8]	6 [5; 7]	7 [6; 8]	<0.001
Self-assessed health status using VAS, score	5 [5; 7]	5 [4; 6]	6 [5; 7]	<0.001
Self-assessed pain at the examination using VAS, score	3 [0; 5]	3 [0; 5]	2 [0; 5]	<0.001
Self-assessed pain within the recent week using VAS, score	4 [2; 6]	5 [3; 6]	4 [1; 6]	<0.001

Note. Data are presented as Me [25th; 75th percentile] except for those marked with an asterisk.

The subsequent multivariate regression analysis (adjusted for age and sex) included 13 GSs with a significance level of p<0.05 based on the results of one-way regression analysis. Multivariate analysis showed that, along with age, six of them were independently associated with CI (see Table 7). Thus, with aging, for every 1 year the risk of CI increases by 6%, and the presence of GS is associated with a 1.4–2.0-fold increase in their risk. The inclusion order of variables in the model was as follows: age, dependence in instrumental activities in daily living, probable depression, frailty syndrome, sensory deficit, dependence in basic activities of daily living, malnutrition. The model sensitivity was 56%, and the model specificity was 79.4%.

Discussion. Study findings detected CI in a significant number of elderly people – 60.8%. Presumably, this number is even higher, since almost 20% of the subjects were not tested for cognitive functions due to their inability to complete the task, most likely due to the presence of severe CI. According to the data obtained in our study, CI was detected in 60.8% of the subjects, and severe disorders in 19.9% (Mini-Cog score 0 or 1). The frequency of CI among elderly patients was actually higher compared to that in other studies. With increasing age, the prevalence of CI increases significantly, which is also confirmed by the results of this study (patients with CI were 6 years older than patients without CI, the risk of CI increased by 10% with increasing age for every 1 year, an increase in age of 5 years was accompanied by an increase in risk of CI by 59%), which is consistent with the data from other studies [1–4]. It should be noted that the cognitive status of patients was assessed only using the Mini-Cog screening scale, which is the best choice in general medical outpatient practice. Most of the world's experts agree that Mini-Cog is the ideal tool for the initial detection of dementia. The most important advantage of the test is its shortness. Its implementation requires a maximum of 3 minutes, while its sensitivity and specificity are very high [13, 14]. In our country, the Mini-Cog test is recommended by the Ministry of Health of Russia for screening for CI in primary outpatient facilities and in prevention centres. [15]

Patients with CI were found to have a lower height, body weight and BMI (low body weight, low and average level of education and low financial resources are associated with a 1.3–2.5-fold increase in the risk of CI), respectively, among them there were more underweight subjects and fewer overweight and obese subjects. Lower height and underweight may be indicative of disease-related poor physical health, or these indicators are associated with malnutrition due to socioeconomic causes (low income level – pensions). One of the causes of weight loss in the elderly is improperly chewed food. This problem can occur with tooth loss and low-quality dentures, which in turn can also be explained by a socioeconomic factor (unavailable high-quality dental care). Weight loss can also be caused by certain medications (diuretics to eliminate edema and, as a result, weight loss due to decreased amount of fluid in the body).

Table 3. *Frequency of use of assistive devices depending on the presence or absence of CI in individuals aged ⩾65 years (n=3545)*

Parameter	CI present (n=2157)	CI absent (n=1388)	p
Use of assistive devices, %	94.9	91.9	<0.001
Number of assistive devices: Me [25th; 75th percentiles] M±SD	 2 [1,5; 3] 2.5±1.4	 2 [1; 3] 2.1±1.3	<0.001
Glasses/lenses, %	79.6	81.3	0.193
Hearing aid, %	9.6	4.0	<0.001
Dentures, %	63.3	56.3	<0.001
Cane, %	42.5	22.4	<0.001
Crutches, %	3.1	1.4	0.001
Rollators, %	5.8	1.2	<0.001
Wheelchair, %	2.5	0.6	<0.001
Orthopedic shoes, %	4.5	6.6	0.009
Orthopedic inserts, %	8.6	14.2	<0.001
Spinal brace, %	4.3	6.0	0.021
Incontinence pads, %	16.2	11.7	<0.001
Absorbent diapers/underpads, %	8.1	3.2	<0.001
Mobility aids (cane, crutches, rollators, wheelchair), %	47.4	23.8	<0.001
Absorbent underwear for urinary/fecal incontinence (incontinence pads, diapers, absorbent underpads), %	21.0	12.9	<0.001

Table 4. *Correlations between mini-Cog scores and Comprehensive Geriatric Assessment scores in individuals aged ⩾65 years (n=3545)*

Parameter	r	p
Gait speed	0.14	<0.001
Hand grip force	0.34	<0.001
Short Physical Performance Battery total score	0.40	<0.001
"Age is Not a Barrier" total score	-0.39	<0.001
GDS-15 total score	-0.36	<0.001
Barthel Index	0.41	<0.001
Lawton Instrumental Activities of Daily Living total score	0.44	<0.001
MNA total score	0.44	<0.001
Self-assessed quality of life using VAS	0.29	<0.001
Self-assessed health status using VAS	0.30	<0.001
Self-assessed pain at the examination using VAS	-0.14	<0.001
Self-assessed pain withing previous 7 days using VAS	-0.13	<0.001
Number of assistive devices used	-0.16	<0.001

The relationship of CI with low height, being underweight, and socioeconomic reasons may be behind the formation of frailty syndrome in this group of patients, which is accompanied by decreased physical and functional activity, adaptive and recovery capacities of the body, and increases in the risk of unfavorable outcomes [16]. Our study revealed that patients with CI had a lower socioeconomic status: thus, among them there were more widows and single people (without a partner), fewer married and divorced people, they more often lived alone or in residential care facilities/nursing homes and less often in a family, they had a lower level of education, poor financial resources, they were more likely to have a disability and were less likely to continue working compared to those without CIs. It is worth noting that CI and frailty share common risk factors such as age, low physical activity, poor nutrition, depression, polypharmacy, and social factors (low income, singlehood, low education). Therefore, the results of this study are quite consistent.

The study found that CI correlated with gait disturbance (decreased gait speed, patients more likely to use mobility aids). Perhaps this is due to the development of gait apraxia, which often accompanies CI. [17] At the same time, movement disorders are the first to occur, affecting balance control and gait. Gait and postural stability disorders are observed in more than 70% of patients with cerebrovascular disease. [18, 19] The presence of gait and postural stability disorders is mentioned as one of the specific diagnostic signs of Binswanger disease. [20] This term refers to the advanced stages of cerebrovascular disease caused by microangiopathy and accompanied by dementia. There is no doubt about the impact of these disorders on quality of life. This fact is also confirmed in our study: patients with CI had lower values of self-assessed quality of life and health status. Falls, injuries, hip fractures, intracranial hemorrhages and other severe complications are a frequent consequence of balance and gait disorders, which also leads to limited functional activity for elderly people. A similar dependence was also revealed in the analysis of the relationship

Table 5. *Frequency of geriatric syndromes depending on the presence or absence of CI in persons aged ≥65 years (n=3545), %*

Parameter	CI present (n=2157)	CI absent (n=1388)	p
Frailty syndrome	72.1	45.5	<0.001
Dependence in activities of daily living	72.3	45.8	<0.001
Dependence in instrumental activities of daily living	65.9	34.2	<0.001
Probable depression	58.4	33.0	<0.001
Urinary incontinence	53.2	35.4	<0.001
Fecal incontinence	5.8	2.8	<0.001
Falls within the previous year	33.9	26.3	<0.001
Postural hypotension	8.2	7.9	0.777
Hearing impairment	15.9	5.8	<0.001
Visual impairment	7.5	1.4	<0.001
Sensory deficit (any)	21.2	6.8	<0.001
Malnutrition	7.8	1.9	<0.001
Chronic pain syndrome	89.8	86.9	0.009
Pressure ulcers	3.0	1.3	0.001

Table 6. *Associations between CI and other geriatric syndromes in individuals aged ≥65 years (n=3545; univariate regression analysis)*

Factors	OR (95% CI)	p
Chronic pain syndrome	1.32 (1.07–1.63)	0.009
Falls within the previous year	1.44 (1.24–1.67)	<0.001
Urinary incontinence	2.08 (1.81–2.39)	<0.001
Fecal incontinence	2.13 (1.48–3.07)	<0.001
Pressure ulcers	2.37 (1.40–4.00)	0.001
Probable depression	2.85 (2.47–3.28)	<0.001
Frailty syndrome	3.09 (2.68–3.56)	<0.001
Dependence in activities of daily living	3.09 (2.68–3.56)	<0.001
Hearing impairment	3.10 (2.41–4.00)	<0.001
Sensory deficit (any)	3.70 (2.93–4.67)	<0.001
Dependence in instrumental activities of daily living	3.71 (3.22–4.28)	<0.001
Malnutrition	4.29 (2.84–6.47)	<0.001
Visual impairment	5.81 (3.60–9.40)	<0.001

Note. Here and in Table. 7: dependent variable – CI.

Table 7. *Associations between CI and other geriatric syndromes in individuals aged ≥65 years (n=3545; multivariate regression analysis adjusted for age and sex)*

Predictors	OR (95% CI)	p
Age as an extended variable	1.06 (1.05–1.07)	<0.001
Dependence in activities of daily living	1.43 (1.21–1.69)	<0.001
Frailty syndrome	1.51 (1.28–1.78)	<0.001
Dependence in instrumental activities of daily living	1.58 (1.34–1.88)	<0.001
Probable depression	1.62 (1.38–1.90)	<0.001
Sensory deficit (any)	1.79 (1.39–2.31)	<0.001
Malnutrition	1.99 (1.27–3.10)	0.003

between CI and pelvic disorders (urinary incontinence). The literature also suggests that CI is often accompanied by pelvic disorders. [21] Micturition disorder is a very common complication of chronic insufficiency of blood supply to the brain; it occurs in the early stages of the disease in 9% of patients. According to R. Sakakibara et al. [22], even before the appearance of neuroimaging signs of the disease, the frequency of pelvic disorders (20%) prevails over motor (16%) and cognitive (10%) disorders.

Patients with CI were significantly more likely to use hearing aids. This may indicate the presence of multisensory insufficiency in this group of subjects, which is confirmed by numerous studies of risk factors for cognitive deficiency. [8] There is no doubt that any distortions of incoming information that accumulate as signals pass from the receptor apparatus to the centres of primary information processing lead to disturbances in subsequent analysis and errors in decision making, which, in fact, is manifested as CI. [23–25] The study results allow us to say that the detected disturbances in the work of two or more analyzers and receptor systems, even in the absence of significant clinical manifestations, are a reflection of systemic processes, including those in the brain, and the emerging syndrome of multisensory insufficiency can be considered as a predictor and biomarker of neurodegenerative diseases. These multiply sensory deficits, in turn, may be the cause of impaired stability and gait in elderly subjects. [26] According to the Global Burden of Disease project [27], the main causes of years of healthy life lost due to disability in the cohort of people over 60 years of age are: sensory disorders, pain in the spine, chronic obstructive pulmonary disease, depression, falls, diabetes mellitus, dementia and osteoarthritis. [28] Our study also found a significant association with more pronounced pain in patients with CI. Pain can be the reason for limited physical and, accordingly, social activity of the subjects and the development of concomitant emotional disorders, which in turn can aggravate the existing cognitive deficiency or cause its development.

Conclusion. The EVKALIPT study was the first to obtain national data on the prevalence and characteristics of CI in subjects at the age of ⩾65 in the general population. The frequency of CI among elderly patients was higher compared with data from other studies.

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Mkhitaryan E.A. http://orcid.org/0000-0003-2597-981X
Vorobieva N.M. http://orcid.org/0000-0002-6021-7864
Tkacheva O.N. http://orcid.org/0000-0002-4193-688X
Kotovskaya Yu.V. http://orcid.org/0000-0002-1628-5093
Koberskaya N.N. http://orcid.org/0000-0002-3110-4764
Selezneva E.V. http://orcid.org/0000-0001-6623-6815
Ovcharova L.N. http://orcid.org/0000-0002-7266-707X