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## PREVALENCE OF DEPRESSION AND LEVEL OF COGNITIVE DISORDERS IN ELDERLY IN NUR-SULTAN CITY AND AKMOL VILLAGE

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### Abstract

**Background.** The article examines the prevalence of depression and the level of cognitive impairment among the elderly. Associations were found between the level of depression and cognitive impairment. The data of our own research are presented. The analysis of the global trend in the prevalence of depression among the elderly is carried out.

**Materials and methods.** We analyzed retrospective data from a cross-sectional study in random population samples of elderly people aged 50-75 years, stratified by gender and age were randomly selected from Nur-Sultan (Astana) and Akmol population register among the urban and rural population was formed. All 1700 individuals (900 urban and 800 rural) were screened in 2014-2016 years. Response rate was 59%. Data from 1008 (457 men and 551 women) were approved for statistical analysis. All of the data, including medical examination data and the laboratory tests, were processed in the STATA program.

**Results.** According to the Study – the prevalence of depression among the urban population is 36.6%, and among the rural population – 2.17%. Since the sample size of both groups was practically the same, the results are statistically significant. The overall prevalence of depression was 19.25%.

The analyzed information on cognitive impairment among the respondents of the urban and rural population. In general, 34.90% of urban respondents have moderate cognitive impairment. Namely, 19.16% of women and 33.19% of men have moderate cognitive impairment. In rural population practically the same, 29.75% of rural tested respondents have moderate cognitive impairments, 38.09% of man and 23.10% of woman.

**Conclusion.** Thus, by analyzing the data obtained on the level of cognitive impairment among the urban and rural population, we obtained the following picture. The level of cognitive impairment is high among men, both in urban and rural areas and amounted to 33.19% and 38.09%, respectively. The level of cognitive impairment among rural women is higher than among urban women and amounts to 23.10% compared to 19.6%. While the prevalence of depression is higher among urban residents and is equal to 36.6% compared with rural residents, whose level was 2.17%.

**Keywords:** depression, cognitive function, mental disorders, old age.

### Резюме

## РАСПРОСТРАНЕННОСТЬ ДЕПРЕССИИ И УРОВЕНЬ КОГНИТИВНЫХ РАССТРОЙСТВ У ЛИЦ ПОЖИЛОГО ВОЗРАСТА В ГОРОДЕ НУР-СУЛТАН И СЕЛЕ АКМОЛ

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**Актуальность темы.** В статье исследуется распространенность депрессии и уровень когнитивных нарушений среди лиц пожилого возраста. Выявлены ассоциации между уровнем депрессии и когнитивными нарушениями. Приведены данные собственного исследования. Проведен анализ мировой тенденции распространенности депрессии среди пожилых людей.

**Материалы и методы.** Проведен анализ ретроспективных данных перекрестного исследования в случайных популяционных выборках лиц пожилого возраста в возрасте 50-75 лет, стратифицированных по полу и возрасту, случайно выбранных из регистра прикрепленного среди городского населения города Нур-Султана (Астаны) и сельского населения села Акмол. Проведен скрининг 1700 человек (900 городских и 800 сельских) в период с 2014 по 2016 гг. Уровень ответов составил 59%. Данные 1008 человек (457 мужчин и 551 женщина) были одобрены для статистического анализа. Все данные, включая данные медицинского осмотра и лабораторных исследований, обрабатывались в программе STATA.

**Результаты.** По данным исследования – распространенность депрессии среди городского населения составляет 36,6%, а среди сельского – 2,17%. Поскольку объем выборки обеих групп был практически одинаковым, результаты статистически значимы. Общая распространенность депрессии составила 19,25%.

В рамках исследования проанализирована информация о когнитивных нарушениях у респондентов городского населения. В целом 34,90% респондентов имеют умеренные когнитивные нарушения. А именно, 19,16% женщин и 33,19% мужчин имеют умеренные когнитивные нарушения. У сельского населения, практически одинаково, 29,75% опрошенных сельских жителей имеют умеренные когнитивные нарушения, 38,09% мужчин и 23,10% женщин.

**Заключение.** Таким образом, анализируя полученные данные по уровню когнитивных нарушений среди городского и сельского населения, мы получили следующую картину. Уровень когнитивных нарушений высок среди мужчин, как в городской, так и в сельской местности и составил 33,19% и 38,09% соответственно. Уровень когнитивных нарушений среди женщин сельского населения выше, чем среди городских и составляет 23,10% по сравнению с 19,6%. Тогда как уровень распространения депрессии выше среди городских жителей и равен 36,6% по сравнению с сельскими жителями, уровень которых составил 2,17%.

**Ключевые слова:** депрессия, когнитивная функция, психические расстройства, пожилой возраст.

Түйіндеме

## НҰР-СҰЛТАН ҚАЛАСЫ ЖӘНЕ АҚМОЛ АУЫЛЫНДАҒЫ ЕГДЕ ЖАСТАҒЫ АДАМДАРДА ДЕПРЕССИЯНЫҢ ТАРАЛУЫ ЖӘНЕ КОГНИТИВТІ БҰЗЫЛУЛАРДЫҢ ДЕҢГЕЙІ

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Эпидемиология және қоғамдық денсаулық сақтау зертханасы Өмір туралы ғылымдар орталығы,  
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**Тақырыптың өзектілігі.** Мақалада егде жастағы адамдар арасында депрессияның таралуы және когнитивті бұзылулардың деңгейі қарастырылады. Депрессия деңгейі мен когнитивті бұзылулар арасындағы байланыстар анықталды. Өзіндік зерттеу деректері келтірілген. Егде жастағы адамдар арасында депрессияның таралуының әлемдік тенденциясына талдау жасалды.

**Материалдары мен әдістері.** Келденең зерттеудің ретроспективті деректеріне талдау Нұр-Сұлтан (Астана) қаланың және Ақмол ауыл тұрғындары арасында тіркелген тізілімнен кездейсоқ таңдалған, жынысы мен жасы бойынша стратификацияланған 50-75 жас аралығындағы егде жастағы адамдардың кездейсоқ популяцияларында жүргізілді. 2014-2016 жылдар аралығында 1700 адам (900 қалалық және 800 ауылдық) скринингтік тексеруден өтті. Жауап беру деңгейі 59% құрады. Статистикалық талдауға 1008 адамның (457 ер адам және 551 әйел) деректері бекітілді. Барлық деректер, соның ішінде медициналық тексеру және зертханалық деректер STATA бағдарламасында өңделді.

**Нәтижелер.** Сауалнама бойынша қала тұрғындары арасында депрессияның таралуы 36,6%, ал ауыл тұрғындары арасында 2,17% құрайды. Екі топтың да іріктеме көлемі дерлік бірдей болғандықтан, нәтижелер статистикалық маңызды. Депрессияның жалпы таралуы 19,25% құрады.

Зерттеу аясында қала тұрғындарынан респонденттердің когнитивті бұзылыстары туралы ақпарат талданды. Жалпы, респонденттердің 34,90%-ында когнитивтік бұзылыстары орташа. Атап айтқанда, әйелдердің 19,16% және ерлердің 33,19% жеңіл когнитивтік бұзылыстарға ие. Ауыл тұрғындарының саны бірдей дерлік, сауалнамаға қатысқан ауыл тұрғындарының 29,75% орташа когнитивтік бұзылыстармен, 38,09% ер адамдар және 23,10% әйелдер.

**Қорытынды.** Осылайша, қала және ауыл тұрғындарының когнитивті бұзылу деңгейі туралы алынған мәліметтерді талдай отырып, біз келесі суретке қол жеткіздік. Ерлер арасында когнитивті бұзылу деңгейі қалада да, ауылдық жерде де жоғары және сәйкесінше 33,19% және 38,09% құрады. Ауыл әйелдерінің когнитивті бұзылу деңгейі қалалық әйелдерге қарағанда жоғары және 19,6% салыстырғанда 23,10% құрайды. Депрессияның таралуы қала тұрғындары арасында жоғары және ауыл тұрғындарымен салыстырғанда 36,6% құрайды, олардың деңгейі 2,17%.

**Түйінді сөздер:** депрессия, танымдық функция, психикалық бұзылулар, қарттық.

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### Introduction

Recently, there has been an increase in the amount of information that appears in the literature regarding research in the field of studying the human psyche. Scientists in this field consider depression as a condition that varies in a wide range of psychological reactions: from feelings of sadness to clinical depression, which is considered to be a severe mental disorder [4].

Depression is one of the most common mental disorders that touches upon the practice of not only a psychiatrist, but also a neurologist, therapist and doctors of other specialties. According to epidemiological studies, the lifetime risk of developing depression is up to 10% in men and up to 20% in women [5, 8, 9].

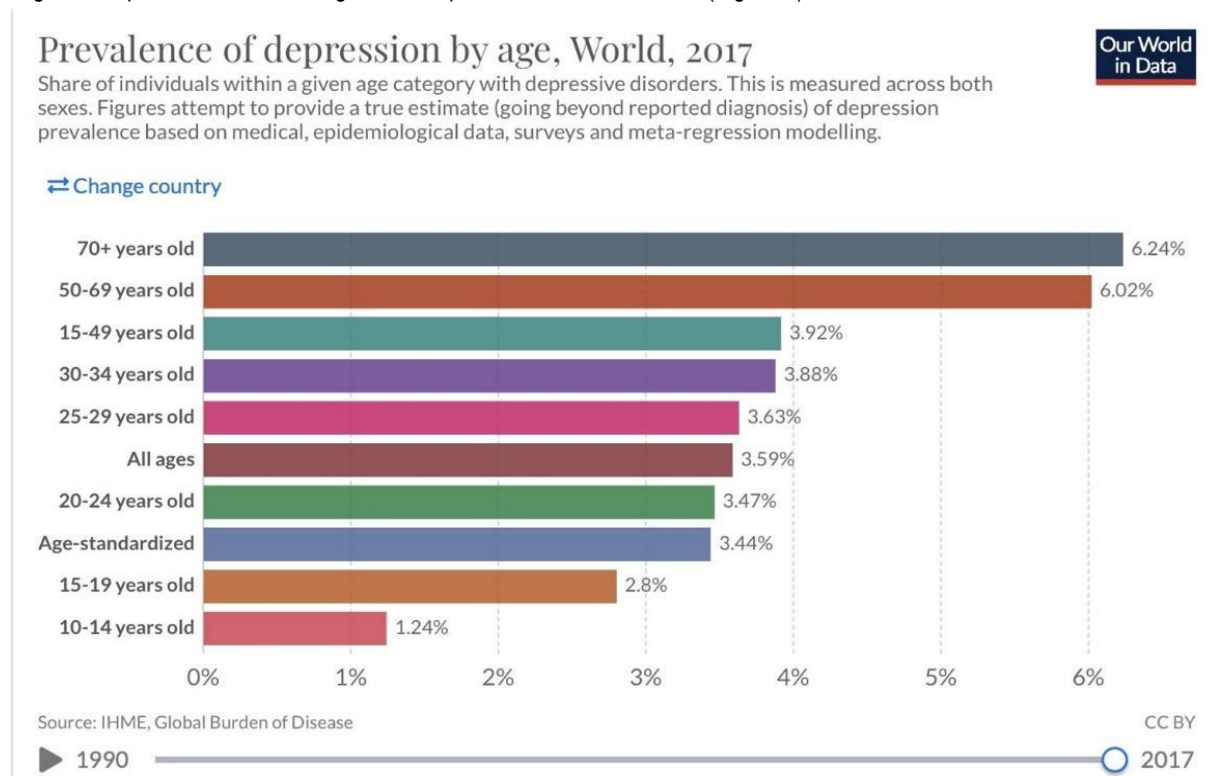
The most important and integral elements of human consciousness are the cognitive functions. These include thinking, concentration abilities, memorization, etc. Experts note that cognitive impairment often accompanies depression.

According to the ICD-10 classification, symptoms of cognitive impairments are also signs of a depressive state.

These include difficulty making decisions, attention disorders, psychomotor disorders, etc.

According to statistics, patients with depression often show cognitive impairment. In particular, the combination of depression and moderate cognitive impairment occurs in 27% of patients, and severe cognitive impairment appears in 13% of patients with depression. For comparison: among healthy people, moderate cognitive impairment occurs only in 2% of the population [4, 5, 8, 9].

Globally, older people (in the age group of 70 and older) have a higher risk of developing depression compared to other age groups. In Kazakhstan, the prevalence of depression prevails in the age group of 70+ years, similar to the global trend. The average number of people in this age group with depressive disorders is measured among both sexes. The figures represent an attempt to provide a true estimation (beyond the established diagnosis) of the prevalence of depression based on medical, epidemiological data, surveys, and meta-regression modeling. The age-standardized group is 3.55% (Figure 1).



**Figure 1. Prevalence of depression by age.**

(Source: [https://ourworldindata.org/IHME, Global Burden of Disease](https://ourworldindata.org/IHME_Global_Burden_of_Disease)).

In the structure of mental health, depression occupies a leading place, according to Our World In Data, 2017 IHME, Global Burden of Disease (Figure 2).

It is important to note that cognitive impairment leads to disability in more than half of depressed patients. People with creative careers, as well as representatives of professions that require analytical skills, suffer more commonly.

Thus, this article makes a goal to identify the associations between the level of depression and cognitive impairment, and to study the prevalence of depression in cognitive disorders in the elderly.

### Materials and research methods

The data were collected with the usage of standardized questionnaires provided by our collaborative partner University College London, UK in the framework of the international HAPIEE study (Health, Alcohol and Psychosocial factors In Eastern Europe). The standard questionnaire included a general assessment of the patient's health, their medical history, lifestyle, nutrition, socioeconomic and psychosocial indicators, as well as physical examination data and patients biometrics. The HAPIEE study was approved by the ethics committee at University College London, UK.

Prevalence by mental and substance use disorder, Kazakhstan, 2017

Share of the total population with a given mental health or substance use disorder. Figures attempt to provide a true estimate (going beyond reported diagnosis) of disorder prevalence based on medical, epidemiological data, surveys and meta-regression modelling.

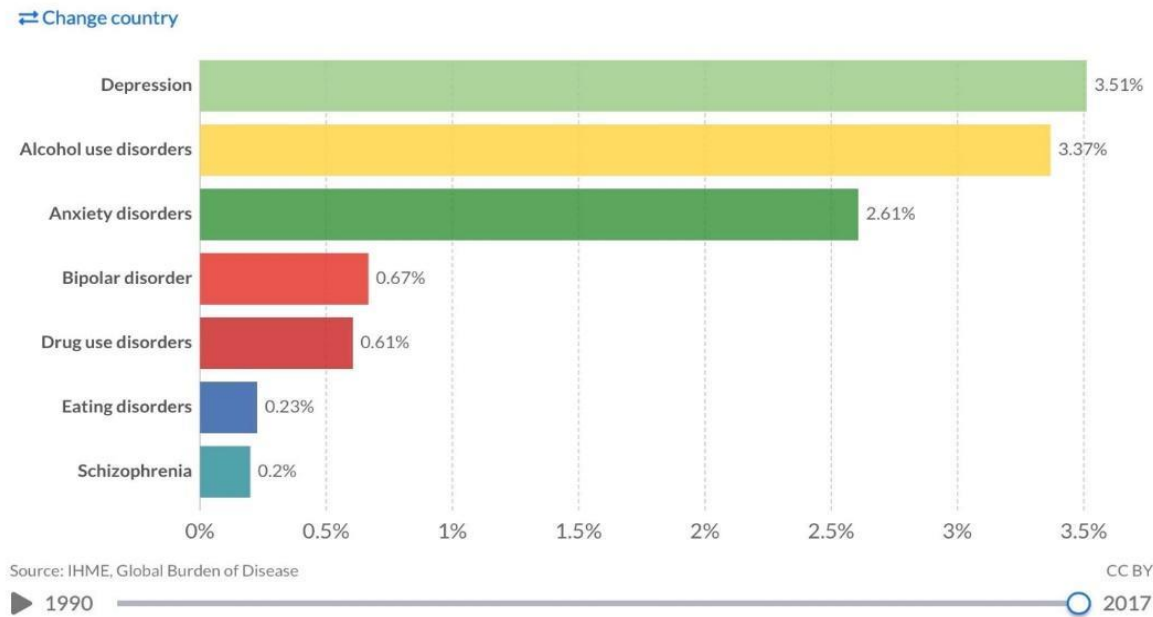


Figure 2. Structure of mental health.

(Source: <https://ourworldindata.org/IHME>, Global Burden of Disease)

We analyzed retrospective data from a cross-sectional study in random population samples of elderly people aged 50-75 years, stratified by gender and age were randomly selected from Nur-Sultan (Astana) and Akmol population register among the urban and rural population was formed.

All 1700 individuals (900 urban and 800 rural) were screened in 2014-2016 years. Response rate was 59%. Data from 1008 (457 men and 551 women) were approved for statistical analysis.

The Study (protocol, questionnaire and the informed consent form) was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Local Ethical Commission of the Private Institution "National Laboratory Astana" (extract from the minutes of the meeting No. 03-020 of 08/07/2020). Written informed consent was obtained from all subjects.

Biometric indicators consisted of: height, weight, measurement of waist and hip circumference, triple measurement of blood pressure.

All of the data, including medical examination data and the laboratory tests, were processed in the STATA program.

The conduct of a test that would determine the level of depression. Cognitive functions were assessed with the usage of four neuropsychological tests (testing methodology within the HAPIEE Study protocol).

Firstly, a 10-word list reminder was used in order to assess verbal memory and learning of the patient. Word lists of 10 common nouns were the same for all participants. Immediate recall was assessed based on correctly recalled words in the window of 3 consecutive 1-minute trials (range 0-30). Delayed recalls were assessed after an interval,

during which other cognitive tests were administered (range 0-10).

Secondly, verbal fluency was assessed by asking participants to name as many animals as possible within 1 minute.

Third, the letter strikethrough test was used to assess the level of attention, mental speed, and concentration. Participants were instructed to cross out two target letters, "P" and "L", embedded in a grid of random letters, as quickly and accurately as possible, within 1 minute (range 0-65).

Results

During research (patient's survey), patients were tested to determine their level of depression. Standardized epidemiological instruments were used as a questionnaire. The instruments were tested by our partners from University College London in the international HAPPY study, which was conducted in Eastern Europe and Russia.

Depression	Urban population	Rural population	Total
NO	317 63.40%	497 97.83%	814 80.75%
YES	183 <b>*36.60%</b>	11 <b>*2.17%</b>	194 <b>*19.25%</b>
Total	500 100%	508 100%	1008 100%

\* p-value <0.0001

Figure 3. Prevalence of depression among urban and rural tested population.

Figure 3 presents a table with information obtained within the framework of our project on the topic of the prevalence of depression among the urban and rural population. As we can see, the prevalence of depression among the urban population is 36.6%, and among the rural population – 2.17%. Since the sample size of both groups was practically the same, the results are statistically significant. The overall prevalence of depression was 19.25%.

The following Figure 4 is a graphic representation of this table. The data shows that the prevalence of depression among the urban population is 36.6% (depression prevails in 183 patients), while among the rural population – 2.17% (11 patients with depression). The overall prevalence of depression was at 19.25% (194 patients with depression). The results obtained are statistically significant.

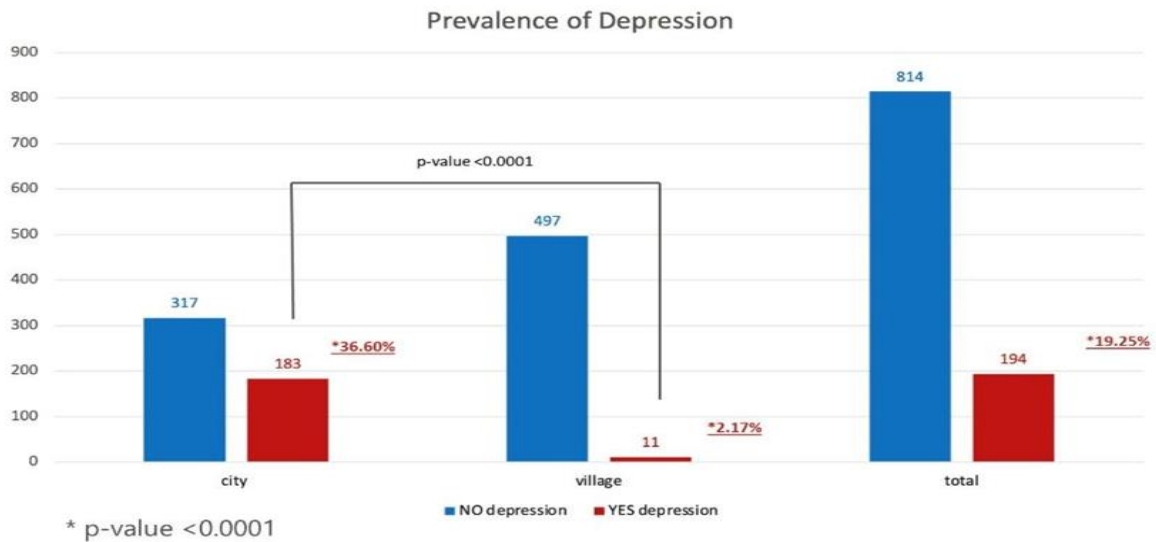


Figure 4. Level of the prevalence of depression among the urban and rural population.

It is important to note that, within the framework of the study, a survey of respondents was conducted in order to determine the level of cognitive properties of the individual. Figure 5 and Figure 6 provides information on the analysis

of survey data on the topic of cognitive function of urban and rural population, respectively. When interviewing respondents, standardized tests were used as well.

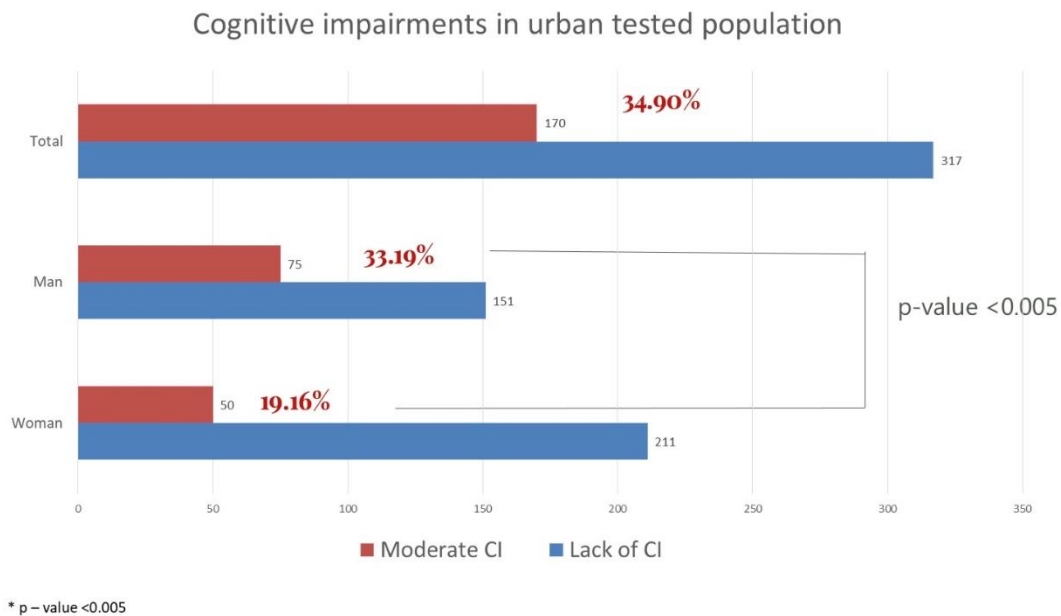
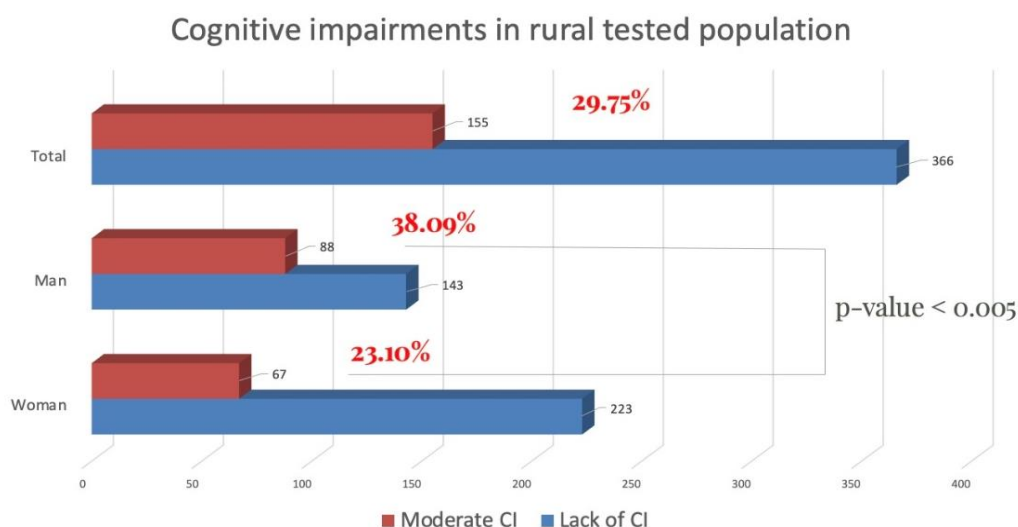


Figure 5. Impairment of cognitive function among the urban population.

Figure 5 presents the analyzed information on cognitive impairment among the respondents of the urban population. In general, 34.90% of respondents have moderate cognitive impairment. Namely, 33.19% of men and 19.16% of women have moderate cognitive impairment. The data from rural

tested population were analyzed, and structure of the cognitive impairments was presented on the Figure 6. Totally, 29.75% of rural tested respondents have moderate cognitive impairments, 38.09% of man and 23.10% of woman.



\*p-value < 0.005

Figure 6. Impairment of cognitive function among the rural population.

**Discussion**

Despite the information above, there is currently no unambiguous understanding of what cognitive disorders actually are. Many associate them with impaired attention, memory and thinking, and the methodology of the cognitive approach with neuropsychological and psychophysiological tests. Meanwhile, however, the matter of cognitive functions requires a broader perspective for assessing its mental disorders, which are qualitatively different from the manifestations of normal mental life [27]. In substance, the cognitive approach projects various psychopathological syndromes and symptoms into a single plane of analysis – the plane of informational systems [2]. So, according to the cognitive approach, depression is a condition in which there are specific violations of the analysis and synthesis of information. Not only is information selectively handpicked, but it also processes one-sidedly and incompletely. These disorders are described in terms of errors of judgment (eg, dichotomous thinking or overgeneralization), "automatic" thoughts, basic beliefs, and cognitive schemas [1, 23]. In addition, when it comes to depression, the so-called "depressive shift" is found, which affects the sphere of attention, thinking, memory and forecasting [20]. These manifestations of depression are based on violations of the mechanisms for evaluating information, which lead to the fact that negative, pessimistic and inhibitory attitudes begin to prevail in patients.

Depressed patients tend to overreact to their mistakes. In a study by R. Cohen et al. [13] showed that such patients made more errors in tests of attention than healthy volunteers. At the same time, not only have the patients with depression received lower results, they also reacted more acutely to them. Mistakes made even in a simple attention task, seemed to increase their sense of failure, which was reflected in their ideas of incompleteness. Another key mechanism for depression, apparently, is associated with impaired ability to a balanced assessment of reality – rumination, i.e. the tendency to constantly return to negative thoughts, ideas and images [17, 24]. This mechanism forms depressive attitudes, and also blocks the ability of patients to solve actual life problems. Cognitive

impairments lead to a general decrease in the efficiency of activity, a slowdown in the associative process, and an increase in the inertia of assessments [11]. The most notable manifestation of cognitive disorders in patients with depression is a violation of the so-called executive functions associated with the activity of the prefrontal cortex and providing flexible problem solving, tracking the results of activities, as well as adaptive behavior change [3, 12, 26].

The development of cognitive dysfunction in depression has both psychological and biological (neurochemical, morphological, pathophysiological) prerequisites.

Cognitive difficulties in patients with depression may be associated with the negative impact of the emotional state on the ability to correctly distribute their attention (impaired attention selectivity). So, a patient with depression can be completely absorbed in his emotional experience, which dominates them, occupying a central position in their thoughts, while the perception, processing, analysis and memorization of other information that is not related to the content of the patient's emotional experiences are naturally violated. Similarly, healthy people perceive and remember information of little importance to them significantly worse than the perception and memorization of significant and emotionally colored information.

A negative impact on cognitive processes has a decrease in motivation, which naturally develops in patients with depression. A decrease in motivation inevitably entails a decrease in the activity of cognitive activity, which ultimately negatively affects the overall effectiveness of solving cognitive problems [14].

Depression is accompanied by a decrease in the synthesis and activity of cerebral neurotransmitters, which is currently considered to be the key neurochemical mechanism responsible for the formation of emotional disorders (the monoamine hypothesis of depression). A decrease in the synthesis and activity in the brain of such mediators as serotonin, norepinephrine, dopamine is described. These changes, of course, can lead not only to emotional, but also to cognitive dysfunction. In particular, the dopaminergic systems of the brain (mesocortical dopaminergic pathway) play an important role in the

distribution and switching of attention and the implementation of cognitive control over the implementation of the intended program (the so-called executive functions of the brain). Activation of the noradrenergic system is necessary for more efficient memorization of information coming from the senses. The serotonergic system of the brain is involved in the formation of motivation for cognitive activity. Thus, a decrease in the synthesis and activity of dopamine, norepinephrine, and serotonin observed in depression can be considered as a neurochemical substrate for the formation of a cognitive syndrome [6].

In addition, depression contributes to the activation of the hypothalamic-pituitary-adrenal system, which leads to increased activity of steroid hormones. The latter negatively affects the processes of neurogenesis and neuroplasticity of the brain, contributing to the activation of age-related cerebral atrophic changes [7, 21]. Indeed, a number of studies using morphometric methods have shown that depression is often associated with more pronounced atrophic changes in the medial temporal region and hippocampus [25]. These changes may underlie the decrease in the ability to memorize new information, which is observed in patients with depression [6, 7, 14, 25].

Modern studies that use functional neuroimaging methods (positron emission and functional magnetic resonance imaging) indicate that cognitive symptoms of depression are accompanied by metabolic changes in structures integrated into closed fronto-subcortical functional systems. Changes are recorded in the orbital and dorsolateral parts of the frontal cortex, striatal bodies, amygdala nuclei, etc. The data presented brings together the pathophysiology of cognitive disorders in depression and the so-called subcortical dementias (Parkinson's disease, vascular brain damage associated with leukoaraiosis, etc.). It should also be noted that, phenomenologically, there is a significant similarity between cognitive dysfunction in depression and diseases with a predominant lesion of the subcortical basal ganglia or the white matter of the brain [15, 16, 19, 22].

It is worth mentioning that some changes in the metabolism of critical cerebral structures (striated bodies, amygdala nucleus) were also observed in clinically healthy individuals genetically predisposed to the development of recurrent depression. This once again emphasizes the independence of the emotional and cognitive axes of depression from each other, which should be taken into account when planning therapy in each specific case [18].

Sleep disturbance is a typical complication of depression. It is secondary, and while being associated with emotional disorder, insomnia can also contribute to the formation of cognitive dysfunction in depression, since the action of processing and consolidating information received during the day in memory is completed during sleep. Lack of sleep leads to a decrease in the activation of the cerebral cortex from the stem-subcortical structures. Clinically, this will be manifested by a decrease in the concentration of attention, activity, and the rate of cognitive activity, which, as mentioned above, is very characteristic of depression [10].

### Conclusion

Thus, by analyzing the data obtained on the level of cognitive impairment among the urban and rural population, we obtained the following picture. The level of cognitive

impairment is high among men, both in urban and rural areas and amounted to 33.19% and 38.09%, respectively. The level of cognitive impairment among rural women is higher than among urban women and amounts to 23.10% compared to 19.6%. While the prevalence of depression is higher among urban residents and is equal to 36.6% compared with rural residents, whose level was 2.17%.

A high percentage of cognitive impairments among the rural population is due to the level of education and socio-economic living conditions (measured calm life in rural areas). And a high percentage of depression among the urban population is associated with the high pace of urban life (with all its inherent attributes), including the development of social networks.

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