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Estimates on the Number of People Blind and Visually Impaired Due to Age-Related Macular Degeneration in Southern Urals

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ABSTRACT

Purpose. To analyze the prevalence of blindness and vision impairment due to age-related macular degeneration.

Material and methods. In the period from 2015 to 2017, cross-sectional clinical and population study Ural eye and Medical Study (UEMS) were conducted at the Ufa Research Institute. **Results.** Among individuals with moderate to severe vision impairment, late stage of age-related macular degeneration was the cause of vision impairment in 14 respondents (7.7%; 95% CI: 3.8–11.6), among whom geographic atrophy was noted in 7 (3.8%; 95% CI: 1.0–6.7) people. Among individuals suffering from blindness, AMD as the main cause of vision loss was identified in 2 respondents (18.2%; 95% CI: 3.2–52.2). The proportion of individuals has moderate to severe vision impairment due to age-related macular degeneration in the study population was 0.24% (95% CI: 0.14–0.41). The proportion of people who became blind due to age-related macular degeneration was 0.03% (95% CI: 0.01–0.14). **Conclusion.** In the population of the Southern Urals, the prevalence of moderate and severe visual impairment due to age-related macular degeneration was 0.24% (95% CI: 0.14–0.41), blindness – 0.03% (95% CI: 0.01–0.14). The data obtained are comparable with those among the regions of the world and the world population as a whole.

Key words: clinical and population studies, age-related macular degeneration, vision impairment, blindness

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Научная статья

Оценка количества слепых и слабовидящих людей из-за возрастной макулярной дегенерации на Южном Урале

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РЕФЕРАТ

Цель. Провести анализ распространенности слепоты и слабовидения по причине возрастной макулярной дегенерации. **Материал и методы.** В период с 2015 по 2017 г. на базе Уфимского НИИ глазных болезней было проведено кросс-секционное клинико-популяционное исследование Ural Eye and Medical Study (UEMS). **Результаты.** Среди лиц с умеренным и значительным снижением зрения возрастная макулярная дегенерация, а именно ее поздняя стадия, послужила причиной снижения зрения среди 14 респондентов (7,7%; 95% ДИ 3,8–11,6), в числе которых географическая атрофия отмечена у 7 (3,8%; 95% ДИ 1,0–6,7) человек. Среди лиц, страдающих слепотой, возрастная макулярная дегенерация как основная причина потери зрения была выявлена у 2 респондентов (18,2%; 95% ДИ 3,2–52,2). Доля лиц, страдающих умеренным и значительным нарушением зрения по причине возрастной макулярной дегенерации, в исследуемой популяции в целом составила 0,24% (95% ДИ 0,14–0,41). Доля лиц, ослепших вследствие возрастной макулярной дегенерации, составила 0,03% (95% ДИ 0,01–0,14). **Заключение.** В популяции Южного Урала распространенность умеренного и значительного нарушения зрения по причине возрастной макулярной дегенерации составила 0,24% (95% ДИ 0,14–0,41), слепоты – 0,03% (95% ДИ 0,01–0,14). Полученные данные сопоставимы с таковыми среди регионов мира и мировой популяции в целом.

Ключевые слова: клинико-популяционное исследование, возрастная макулярная дегенерация, слабовидение, слепота

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RELEVANCE

Age-related macular degeneration (AMD) is one of the leading causes of visual impairment and blindness in Western countries and the most common cause of visual disability in developed countries. Every year we note an increase in the AMD prevalence among people aged 40 years and older, which indicates that the age of those who may develop the disease is becoming younger [1–7]. Also AMD's social and economic impact is expected to increase substantially due to population growth and ageing [4]. About 9.4% of Australian adults are visually impaired, with AMD being the primary cause of visual impairment in half of them [8]. AMD is the leading cause of visual disability in 26% of cases in Latin America [9] and accounts for about 50% of registered blindness in the UK [10, 11]. Since 2015 retinal diseases have become the main cause of visual loss in Russia (25% of all cases), with AMD accountings for a significant proportion (12.5%) [12, 13]. However, to date, there is a lack of data on the prevalence of AMD-related vision impairment, which necessitates further research in this area.

PURPOSE

To analyze the prevalence of blindness and vision impairment due to age-related macular degeneration.

MATERIAL AND METHODS

Between 2015–2017 the cross-sectional population-based study Ural Eye and Medical Study (UEMS) was conducted at the Ufa Eye Research Institute to assess the prevalence of eye diseases among people aged 40 and older

and living in the Southern Urals region. Inclusion criteria included informed consent to participate, and age of 40 years or older, and permanent residence in the Southern Urals as study region.

The survey was conducted in accordance with the basic principles of the Helsinki Declaration and Good Clinical Practice (GCP) guidelines. Informed consent was obtained from all individual participants (or legal guardians).

The study included questionnaires survey, general medical and ophthalmic examinations. The study protocol involved the assessment of 683 criteria, 293 of which were related to demographic characteristics and social status, living conditions and general health, and 355 parameters were related to eye examination results. The ophthalmic examination included general such as: visual acuity measurement, refractometry, tonometry, biomicroscopy, as well as specific methods such as corneal topography, automated perimetry, fundus photography (VISUCAM 500, Carl Zeiss Meditec AG, Jena, Germany), optical coherence tomography (OCT) (RS-3000, NIDEK co., Ltd., Aichi Japan).

AMD was diagnosed based on ophthalmoscopy and OCT images. Visual acuity was determined with maximum correction.

The assessment of the presence of blindness and visual impairment was carried out in accordance with the WHO classification (for the convenience of data analysis, respondents with moderate and severe visual impairment were combined into one group):

- mild vision impairment – visual acuity (VA) from 6/12 to 6/18 inclusive (from 0.5 to 0.3 inclusive);
- moderate to severe – VA <6/18 and $\geq 3/60$ (<0.3 and ≥ 0.05);
- blindness – VA <3/60 (<0.05) [14].
- Visual acuity in the better eye or single one was taken into account.

Prevalence of visual impairment and blindness due to age-related macular degeneration in world regions

Table

Таблица

Распространенность нарушений зрения и слепоты вследствие возрастной макулярной дегенерации в регионах мира

Region Регион	Percentage of individuals with moderate and severe vision impairment due to AMD, % (95% CI) Доля лиц, с умеренным и значительным снижением зрения по причине ВМД, % (95% ДИ)	Percentage of individuals with blindness due to AMD, % (95% CI) Доля лиц, ослепших по причине ВМД, % (95% ДИ)
Global Глобально	0.34 (0.27–0.41)	0.10 (0.08–0.14)
South Asia, East Asia and Oceania Южная Азия, Восточная Азия и Океания	0.46 (0.37–0.56)	0.08 (0.06–0.11)
Central Europe, Eastern Europe, Central Asia Центральная Европа, Восточная Европа, Центральная Азия	0.16 (0.13–0.19)	0.04 (0.03–0.06)
High-income countries Страны с высоким уровнем дохода	0.14 (0.11–0.17)	0.11 (0.08–0.14)
Latin America and the Caribbean Латинская Америка и Карибский бассейн	0.25 (0.21–0.31)	0.05 (0.04–0.07)
North Africa and Middle East Северная Африка и Средний Восток	0.55 (0.44–0.68)	0.22 (0.16–0.30)
South America Южная Америка	0.42 (0.34–0.51)	0.10 (0.07–0.15)
Sub-Saharan Africa Африка к югу от Сахары	0.50 (0.40–0.61)	0.15 (0.11–0.20)
Southern Ural Южный Урал	0.24 (0.14–0.41)	0.03 (0.01–0.14)

Statistical data processing was performed using the IBM SPSS Statistics 23.0 software package (USA). At $p < 0.05$ the comparison was considered statistically significant. CI was calculated using the Wilson method with continuity correction.

RESULTS AND DISCUSSION

A total of 5893 respondents results were enrolled in the study on prevalence of causes of visual impairment. The mean age of the participants was 59.0 ± 10.7 years (range 40–94 years). Mild visual impairment was detected in 184 respondents (3.1%; 95% CI: 2.7–3.6), moderate to severe visual impairment (MSVI) – in 182 respondents (3.1%; 95% CI: 2.7–3.5) and blindness in 11 respondents (0.19%; 95% CI: 0.10–0.34).

Among those with moderate to severe vision impairment, AMD, specifically its late stage, was the cause of vision impairment in 14 respondents (7.7%; 95% CI: 3.8–11.6), 7 of them had developed geographic atrophy (3.8%; 95% CI: 1.0–6.7). Among the blind participants, AMD was the main cause of vision loss in 2 respondents (18.2%; 95% CI: 3.2–52.2).

The proportion of individuals with moderate to severe visual impairment due to AMD in the study population was 0.24% (95% CI: 0.14–0.41), with 0.12% (95% CI: 0.05–0.26) having low vision due to geographic atrophy, and 0.03% being blind due to AMD (95% CI: 0.01–0.14) respectively.

According to the Vision Loss Expert Group of the Global Burden of Disease (GBD) Study, a global meta-analysis estimating the number of people with low vision and blindness due to age-related macular degeneration, in 2020 6.23 million people (95% CI: 5.04–7.58) worldwide were estimated with MSVI (2,747,000 male and 2,743,000 female). AMD-related blindness affected 1.85 million people (95% CI: 1.35–2.43) (664,000 male and 1,185,000 female). Thus, in 2020, AMD ranked second among the causes of irreversible blindness globally [2]. From 2000 to 2020, there was a projected decrease in the prevalence of blindness caused by AMD in all regions except Latin America and the Caribbean, and the prevalence of AMD-related MSVI increased in many super-regions except North Africa, the Middle East and Sub-Saharan Africa, with wide discrepancies between regions [2].

The overall prevalence of MSVI impairment due to AMD among individuals aged 50 or older was estimated at 0.34% (95% CI: 0.27–0.41) globally, with the highest prevalence observed in North Africa and the Middle East – 0.55% (95% CI: 0.44–0.68) and the lowest in high-income countries – 0.14% (95% CI: 0.11–0.17), whilst in Central Europe, Eastern Europe and Central Asia – it was 0.16% (95% CI: 0.13–0.19). Meanwhile, the global prevalence of blindness due to AMD was estimated in the meta-analysis to be 0.1% (95% CI: 0.08–0.14). The regions with the highest prevalence of blindness were North Africa and the Middle East with 0.22% (95% CI: 0.16–0.30) and the regions with the lowest prevalence

were Central Europe, Eastern Europe and Central Asia with 0.04% (95% CI: 0.03–0.06), also with the lowest number of individuals with presenting blindness due to AMD per world region (0.06 million people; 0.04 to 0.08) (Table) [2, 14].

The population-based study Ural Eye and Medical Study (UEMS) results showed that the number of people with moderate to severe visual impairment was close to that in Latin America and the Caribbean, higher than in Central Europe, Eastern Europe, Central Asia and lower than in North Africa and the Middle East. The proportion of people with AMD-related blindness in the Southern Ural is close to those in Central Europe, Eastern Europe and Central Asia.

CONCLUSIONS

The prevalence of moderate to severe visual impairment due to age-related macular degeneration was 0.24% (95% CI: 0.14–0.41), the prevalence of AMD-related blindness due to AMD was 0.03% (95% CI: 0.01–0.14) in the population of Southern Urals. The findings are comparable to data obtained in the world regions and in the world's population as a whole.

ЛИТЕРАТУРА/REFERENCES

- Jonas JB, Bourne RRA, White RA, Flaxman SR, Keeffe J, Leasher J, Naidoo K, Pesudovs K, Price H, Wong T.Y., Resnikoff S, Taylor HR; Vision Loss Expert Group of the Global Burden of Disease Study. Visual impairment and blindness due to macular diseases globally: a systematic review and meta-analysis. *Am J Ophthalmol*. 2014;158(4): 808–815. doi: 10.1016/j.ajo.2014.06.012
- Vision Loss Expert Group of the Global Burden of Disease Study and the GBD 2019 Blindness and Vision Impairment Collaborators. Global estimates on the number of people blind or visually impaired by age-related macular degeneration: a meta-analysis from 2000 to 2020. *Eye*. 2024; 1–13. doi: 10.1038/s41433-024-03050-z
- GBD 2019 Blindness and Vision Impairment Collaborators; Vision Loss Expert Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. *Lancet Glob Health*. 2021;9(2): e144–e160. doi: 10.1016/S2214-109X(20)30489-7
- Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. *Lancet Glob Health*. 2021;9(4): e489–e551. doi: 10.1016/S2214-109X(20)30488-5
- Bikbov MM, Zainullin RM, Gilmanshin TR, Kazakbaeva GM, Rakhimova EM, Rusakova IA, Bolshakova NI, Safiullina KR, Yakupova DF, Uzmanbaeva YV, Khalimov TA, Salavatova VF, Panda-Jonas S, Arslangareeva II, Nuriev IF, Bikbova GM, Zaynetdinov AF, Zinnatullin AA, Jonas JB. Prevalence and Associated Factors of Age-Related Macular Degeneration in a Russian Population. *The Ural Eye and Medical Study*. *Am J Ophthalmol*, 2020;210: 146–157. doi: 10.1016/j.ajo.2019.10.004
- Cheung CMG, Laude A, Yeo I. Systemic, ocular and genetic risk factors for age-related macular degeneration and polypoidal choroidal vasculopathy in Singaporeans. *Scientific Report*. 2017;(7): 1–10. doi: 10.1038/srep41386
- Connolly E, Rhatigan M, O'Halloran AM, Muldrew KA, Chakravarthy U, Cahill M, Kenny RA, Doyle SL. Prevalence of age-related macular degeneration associated genetic risk factors and 4-year progression data in the Irish population. *British Journal of Ophthalmology*. 2018;102: 1691–1695. doi: 10.1136/bjophthalmol-2017-311673
- Sight loss: a public health priority 2019. Written evidence from the Royal National Institute of Blind People (RNIB). The Royal National Institute of Blind People: URL: <https://www.rnib.org.uk/sites>
- Limburg H, Espinoza R, Lansingh VC, Silva JC. Functional low vision in adults from Latin America: findings from population – based surveys in 15 countries. *Rev Panam Salud Publica*. 2015;37(6): 371–378.
- Markowitz M, Rankin M, Mongy M, Patino BE, Manusow J, Devenyi RG, Markowitz SN. Rehabilitation of lost functional vision with the Argus II retinal prosthesis. *Canadian Journal of Ophthalmology*. 2018;53(1): 14–22. doi: 10.1016/j.cjco.2017.12.001
- Sommer A. Preventing blindness and saving lives: the centenary of vitamin A. *JAMA Ophthalmology*. 2014;132(1): 115–117. doi: 10.1001/jamaophthalmol.2013.5309
- Ивахненко О.И., Нероев В.В., Зайцева О.В. Возрастная макулярная дегенерация и диабетическое поражение глаз. Социально-экономические аспекты заболеваемости. *Вестник офтальмологии*. 2021;137(1): 123–129. [Ivakhnenko OI, Neroev VV, Zaitseva OV. Age-related macular degeneration and diabetic eye disease. Socio-economic aspects of morbidity. *Bulletin of ophthalmology*. 2021;137(1): 123–129. (In Russ.)]
- Липатов Д.В., Лышканец О.И. Интравитреальная терапия диабетического макулярного отека в России: современное состояние проблемы. *Вестник офтальмологии*. 2019;(4): 128–139. [Lipatov DV, Lyshkanets OI. Intravitreal therapy of diabetic macular edema in Russia: current state of the problem. *Bulletin of ophthalmology*. 2019;(4): 128–139. (In Russ.)]
- Bikbov MM, Kazakbaeva GM, Zainullin RM, Gilmanshin TR, Nuriev IF, Zaynetdinov AF, Yakupova DF, Uzmanbaeva YV, Panda-Jonas S, Mukhamadieva SR, Khikmatullin RI, Aminev SK, Arslangareeva II, Jonas JB. Prevalence and causes of vision impairment and blindness in the Russian Ural Eye and Medical Study. *Scientific Report*. 2020;(10): 12397. doi: 10.1038/s41598-020-69439-4

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УФИМСКИЙ НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ИНСТИТУТ ГЛАЗНЫХ БОЛЕЗНЕЙ
ФГБОУ ВО БГМУ Минздрава России



ПРЕДЛАГАЕТ

Устройство для ионофореза роговицы «ИОН»

Устройство предназначено для трансэпителиального насыщения стромы рибофлавином посредством ионофореза при выполнении УФ кросслинкинга роговицы.



Регистрационное удостоверение
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Применение устройства «ИОН» позволяет сохранять эпителий и дооперационную толщину роговицы.

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