

CATARACT: THE REVIEW OF PROBLEMS AND SOLUTIONS

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Abstract. Nowadays cataract remains one of the urgent problems that public healthcare needs to address. It is the leading cause of blindness and disability worldwide. Although there is constant research to establish cataract pathogenesis and offer management, the data are insufficient and need critical reflection. The objective of this paper is to examine national and international studies on cataract development and treatment so that to specify approaches addressing cataract issues. The article presents data from literature and systematic reviews, clinical guidelines and protocols concerning epidemiology, risk factors, classification, pathogenesis, and mortality risk of cataracts.

Keywords: cataract, risk factors, classification, pathogenesis, and mortality risk of cataracts.

Introduction. Blindness remains an urgent problem of modern ophthalmology, as well as one of the main public health problems [1, p. 130]. According to the systematic review and meta-analysis by Joshua R Ehrlich et al., the risk of mortality was higher in people with visual impairments, in contrast to those with normal vision or mild visual impairment [2, p. 418].

According to the World Health Organization, about 2.2 billion people worldwide have visual impairments, and almost half of them could have prevented this pathology [3, p. 144]. According to the All-Russian Public Organization "Association of Ophthalmologists", cataract is considered to be partial or complete opacification of the lens of the eye, commonly developing after 60 years of age and manifested by various degrees of visual impairment up to the complete loss of objective vision [4, p. 7]. Today cataract is the second leading cause among all cases of vision loss, being inferior only to uncorrected refractive errors, which determines its medical and socio-economic significance, along with age-related macular degeneration, glaucoma, diabetic retinopathy, corneal opacity, trachoma. Most people with lens opacity live in low-income countries [5, p. 1495]. However, the data on cataract incidence and prevalence change regularly with the constant growth of epidemiological and public health studies.

Therefore, ophthalmological researchers and clinicians have to be updated with fundamental innovations and practical applications of cataract research. With regard to the above, the objective of this paper is to analyse recent epidemiological research data on cataract so that to compare and contrast the approaches and findings/

Materials and methods. The authors used a search for literature data on the epidemiology of cataracts. The literature corpus included recent epidemiological studies, systemic and literature reviews as well as clinical guidelines on cataract treatment and prevention. The methodological techniques involved analysis, synthesis, comparison and interpretation of the concepts and literature findings.

Results and discussion. Cataract is one of the leading causes of visual impairment and reversible blindness in the world. The disease occurs in every sixth person over the age of 40 and in most people by the age of 80. According to a number of international studies, cataracts are considered to be the main cause of blindness in middle- and low-income countries [6, pp. 1-23].

The recent literature review shows that there are several classifications that are based either on clinical or epidemiological criteria: they relate to clinical practice, to the use of epidemiological analysis or drug manufacturing for conservative treatment.

The light conductivity of the lens depends on the type of cataract and the localization of opacities. According to the intensity of opacities and the values of visual acuity, the following stages of cataract are distinguished: initial, immature, mature and overripe. Ophthalmologists do not have a single point of view on the issue of diagnosis. Thus, there is an opinion that it is more correct to attribute only those opacities in the lens that cause a decrease in visual acuity [7, p. 474].

In the Russian Federation the prevalence of cataracts is 3.36% for the urban population and 3.63% for the rural population. Apparently, there has been one study conducted in the Russian Federation according to the international standard RAAB, in which the sample was 4044 people aged 50 years. The study made it possible to diagnose cataracts with a decrease in visual acuity to 0.3 in 8.69% of the examined, which is 2.5 times more than official statistics, and women were 2 times more likely to suffer from this pathology than men [8, p. 84].

When studying the dynamics of cataract incidence, the increase in the number of new cataract cases growth has been reported in certain Russian regions and on the national scale. Along with all the achievements of modern ophthalmology, cataract prevalence is permanently high, being the second most common cause of visual impairment worldwide. According to the multicenter research, higher rates of cataract incidence are gender-related and more commonly occurred in women compared to men [9, p. 98].

The research also identified differences in the geographical distribution of cataracts. The findings suggest that the incidence is four times as common in low- and middle-income regions as in their high-income counterparts. According to scientific research by R. Acosta et al. the prevalence of cataracts in Europe, the USA and Australia is significant and ranges from 5% to 30% [10, p. 509] compared to 10.7% in Taiwan, 9.7% in Singapore, 2.2% in Indonesia, and 5.3% in Nepal [11, p. 40]. The proportion of cataracts in Saudi Arabia was 55.1%, 31.1% in Afghanistan, 9.7% in Israel, 34.9% in Syria [12, p. 103]. Among the Chinese population, cataract as a cause of blindness was detected in 41.1% of

patients, and in 49.4% among the visually impaired, while the prevalence of visual impairment and blindness in the age group over 60 years was 73.1% [13, p. 282].

The pathogenesis of cataracts still requires a comprehensive examination and thorough understanding. According to several studies, in cataract development the composition of the intraocular fluid of the anterior chamber of the eye changes, pathological metabolites are formed, which leads to the destruction of the protein of the lens fibers. It was found that the activity of carbonic anhydrase, pyruvate phosphokinase, ATP synthase decreases with cataract; the amino acid and trace element composition changes; the amount of sodium, calcium, zinc, and water in tissues increases, and there is a decrease in potassium, aluminum, soluble proteins, sulfur-containing amino acids, bound c-crystallins, ascorbic acid, riboflavin, and cytochrome. It is still unknown what is the trigger of these changes.

There are several risk factors that affect the development of cataracts. These include age, the presence of diabetes mellitus, the use of glucocorticosteroids for a long time, previous surgical treatment of the eyes. It should be noted that there is a relationship between certain risk factors for cataract development and the type of lens opacities. Thus, risk factors for cortical cataracts are diabetes mellitus, heredity, ionizing radiation (low and high doses), smoking; for nuclear cataracts – diabetes mellitus, heredity, arterial hypertension, previous vitrectomy, smoking, exposure to ultraviolet (hereinafter – UV) rays of the B spectrum; for posterior capsular cataracts – the use of inhaled glucocorticosteroids, ionizing radiation (low and high doses), obesity, eye injuries, previous vitrectomy, retinal pigment degeneration, local and systemic use glucocorticosteroids, for a mixed form - previous vitrectomy, smoking, exposure to UV rays of the B spectrum. Most of the studies concerning the study of risk factors for cataracts are observational. With this in mind, it is not possible to reliably confirm cause-and-effect relationships, because studies are not conducted in a standardized way.

Some research findings demonstrate that almost 80% cases of visual impairment associated with cataracts can be restored after re-

removal of the clouded lens. However, the significant economic costs of this approach should be taken into account. Currently, according to estimates, about 1,750 thousand patients suffer from cataracts in the Russian Federation. The number of cataract extraction operations performed annually covers only a third of the patients in need of such treatment. This indicator varies depending on the subject of the Russian Federation. Surgical treatment for cataracts refers to high-tech types of medical care, which is more accessible to patients in large settlements and cities compared to residents of rural areas [14, pp. 600-612].

The results of a number of studies have shown anxiety and fear in patients before surgery, which in the future may cause refusal or postpone the date of hospitalization. In addition, elderly people may have contraindications for this operation due to the presence of concomitant pathology [15, p. 197].

According to the United Nations Population Division, it is projected that about 50 million people aged 60 will suffer from cataracts by 2025. According to the World Vision Problems Report, about \$24.8 billion needs to be spent to address the problem of insufficient coverage for cataracts and uncorrected refractive errors that could be prevented. These financial investments are needed now, but this

requires additional planning and investment. For example, by 2030, according to WHO estimates, low- and middle-income countries should invest in creating jobs for 23 million medical workers and building more than 415,000 medical facilities. However, appropriate measures have not yet been taken [16, p. 4].

Conclusion. Cataract is still an urgent problem that requires systematic analysis and management to assess its contribution to the unfavorable ophthalmological situation in general. For competent management and specialized medical care it is necessary to study the parameters of risk areas, improve the availability of high-tech care, solve the problem of insufficient medical coverage for cataracts, determine financial investments for job creation and professional training of medical workers.

It may be confirmed that the unified approach to classification and diagnosis of cataract has not been developed yet. Although numerous studies on cataract prevention and management have been conducted, they have collected inconsistent evidence to confirm the causal relationships of cataract risk factors in a standardized way, the pathogenesis and the trigger mechanism, which affects the management of ophthalmic care processes.

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КАТАРАКТА: ОБЗОР ПРОБЛЕМ И РЕШЕНИЙ

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***Аннотация.** На сегодняшний день катаракта остается одной из насущных проблем общественного здравоохранения. Она является основной причиной слепоты и инвалидности во всем мире. Исследования в области этиологии и методов лечения катаракты не теряют своей актуальности, однако их данные и подходы к решению проблем катаракты требуют обобщения и систематизации. Целью настоящей работы является обзор современной научной литературы, а также международных клинических рекомендаций по профилактике и лечению катаракты. В статье обобщаются данные актуальных исследований по эпидемиологии, факторам риска, классификации, патогенезу и риску смертности от катаракты*

***Ключевые слова:** катаракта, факторы риска, классификация, патогенез, риск смерти от катаракты.*