

# Modern Features of Epidemiology and Prevention of Major Eye Diseases of Infectious and Non-Infectious Etiology (Literature Review)

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It is a common knowledge that today not only practical health services, but also modern science, are entrusted with the tasks of medical prevention. It is required to activate the preventive direction and create a scientific basis, as well as socio-medical and political-financial-comfortable environment to provide a mechanism for the development and implementation of preventive services [1]. Literacy in the prevention of socially significant diseases is a key tool in solving modern socio-demographic problems, due to the relatively high level of hard endpoints (premature mortality, irreversible blindness) and a significant level of prevalence of risk factors (RF) of chronic diseases of infectious or non-infectious etiology [2]. This is reflected in a large number of studies devoted to the search for advanced innovative technologies for early diagnosis, prevention and treatment of these pathologies. They have the same logic: it is impossible to reduce the still high numbers of vision disability in the world "in the age of high technologies in medicine", including the introduction of modern technologies and drugs. But historically, in the 60s of the twentieth century, during the years of active work on the prevention of trachoma, carried out by all ophthalmologists of the republics of Central Asia, patients with "endpoints" of this disease became less and less every year, and soon trachoma was eliminated [3]. The history of ophthalmology dictates the need to reform it through aspects of historical preventive ophthalmology. The merit of preventive ophthalmology in organizing the fight against social eye diseases is invaluable. Why? The fact is that many aspects of the development of major eye diseases still remain unclear. For example, in some cases, with normal intraocular pressure, the patient has a typical picture of glaucomatous optic neuropathy [4]. Often there are patients with a clinical situation when, with high values of ophthalmotonus – intraocular pressure (IOP), no changes were observed in the optic nerve head for many years. Meanwhile, every ophthalmologist believes that the only proven way to slow the progression of glaucomatous process, is the IOP reduction, according to some researchers

this opinion provides the explanation for the fact of late diagnosis of glaucoma in a stage of irreversible blindness [5, 6].

Therefore, today, in addition to drug therapy (which are used in 56% of cases, monotherapy is prescribed in 29%, combined therapy in 71% of patients), a rational population (healthy person) - focused epidemiological research (for the purpose of early detection) and pre-nosological glaucoma prevention and other eye diseases of infectious and non-infectious etiology [7]. It is important to note, with much regret, that even in developed countries, there are no federal programs to prevent eye diseases. This significantly complicates preventive work on the early detection of socially significant eye diseases and their risk factors among the population, makes the study of the epidemiological characteristics of pathologies of visual system of infectious and non-infectious etiology (PVSINE) urgent. According to world data, due to late diagnosis and insufficient use of epidemiologist - prophylactic approaches, the incidence of a significant decrease in vision up to its complete loss is increasing [8]: every tenth patient with diabetes mellitus (DM) develops a threat of vision loss [9]; there is still the fact of "non-detection" of complications - the actual prevalence of diabetic retinopathy with active screening is 1.5-2 times higher than that recorded by passive referral [9]; the real number of patients with eye diseases (socially significant) is significantly higher than the register data, which requires their more active detection [10]; "Failure of observation" at the present stage may consist in the absence of dynamic screening monitoring of the fundus condition and timely prescription of treatment for the prevention of PVSINE and their complications in persons with risk factors and / or chronic comorbid diseases [11].

Modern society and the generation of people force the use of innovative ophthalmic, preventive technologies in relation to

many RFs of socially significant eye diseases, starting with students and / or even earlier.

The obvious need for the use of preventive technologies in universities, colleges and general education schools has been proven [12]. This need is actualized with the high prevalence of PVSINE RFs and their impact on mortality / disability in young people. So, in the GATS study (2017) it was found that the average age at the start of smoking is 18.1 years [13]. Other studies have shown that the actual age at the start of smoking is much lower; it is rapidly decreasing and does not exceed 15 years [13].

There is another alarming problem - alcohol intake; recently, there has been a tendency towards the "rejuvenation" of alcoholism (earlier onset of alcohol consumption - 13-15 years versus 16-17 years in previous generations) [14], among all deaths at the age of 15-54 years, 52% were associated with alcoholic beverages [15], the prevalence of regular consumption of alcoholic beverages among foreign students ranges from 13 to 80% [16, 17, 18].

The problem is aggravated by the fact that, according to expert estimates, up to 10% of high school and university students have experience in using narcotic drugs (cannaboids, ecstasy, amphetamine derivatives or any prohibited substance - ESPAD average), the proportion of drug users among students, according to ESPAD and NIDA, is even more - from 30% in Europe to 49% in the United States [19, 20, 21].

Thus, the non-obviousness of the results of research on the prevention of risk factors among young students dictates the need to continue the search for new advanced innovative PVSINE techniques in this direction and / or to start the prevention of these pathologies and their RF as soon as possible throughout the process of teaching young people.

It is no secret that a prerequisite for the successful treatment of any disease, including PVSINE, is the mandatory / exact implementation by the patient of all the preventive recommendations of the doctor [22]. In addition, the prognosis of these diseases largely determines the adherence of patients to treatment (that is, loyalty, dedication to prevention or treatment). Modern researchers are convinced of this [23, 24, 25].

Makogon S.I. et al. (2019) analyzed the factors influencing the motivation for long-term treatment of 366 elderly and senile glaucoma patients. The reasons for insufficient motivation for doctors' recommendations were identified: asymptomatic disease (55.2%), low level of awareness of the disease (51.9%), lack of a visible effect of the therapy (50.8%), the presence of side effects of treatment (47.5 %), forgetfulness (36%) and lack of attention from the attending physician (63.4%). The proposed model by researchers (to increase the level of motivation) has increased the level of treatment effectiveness [26].

Often, socially significant eye pathologies are involution-dependent diseases. The prevalence of such combined pathology, for example, glaucoma and cataracts, varies from 17.0 to 38.6% and is one of the most common causes of

blindness [27]. Therefore, at present, glaucoma is defined as a group of chronic eye diseases (more than 60), accompanied by a triad of signs: 1) periodic or constant increase in IOP levels above the tolerant level; 2) atrophy of the optic nerve (by excavation); 3) characteristic changes in visual fields [28]. Among POZINE, this pathology certainly differs ("green water", or "green cataract" from Grum Star) as a serious and dangerous consequence of the disease: by 2030, the number of glaucoma sufferers reaches 110 million people: every minute in the world, glaucoma is going blind 1 person, and every 10 minutes - one child [29]; a significant increase in glaucoma as part PVZINE noted and / or predicted in many multicenter epidemiological studies: Dravitsa of N. T.et.al (2014) - in Japan [30], Lumbrosom B. (2014) - in Rispoli [31], Remo S. Jr (2006) - in Brazil [32] and Kuryshva N.I. (2007) - in Russia [33].

In recent years, new data have appeared on the radiation aspects of PVSINE. Thus, Minamoto A.et. al (2004) in Japan, in people who survived the atomic bombing show that after 55 years the relative risk for cataracts at a radiation dose of 136 is 1.07-1.49 [34]. UNSCEAR (Scientific Committee on the Effects of Atomic Radiation at UN, 2000) and ICRP (International Commission on Radiological Protection) noted the possibility of cataracts appearing after a single exposure to a dose of 2 Gr or more [35, 36]. However, the literature on this issue is contradictory. So, according to Gadai Yu.V. et al. (1993) acceleration of the development of cataracts in liquidators of the accident at Chernobyl Nuclear-Power Plant (CNPP) (Chernobyl disaster) is noted at doses of the order of 1 Gr [37], and according to the information of L.I. Krasnikova and V.A. about 0.3 Gr [38]; but, as these authors assert, their appearance among liquidators was also noted at doses 10 times lower than the generally accepted blame.

Kvasova M.D. et al. (2011) summarizing the literature and their own results presented the following, in our opinion, practical conclusions:

Small doses of radiation, apparently, contribute to involutional-dystrophic changes in the vessels of the eye;

Autoimmune humoral shifts in relation to the lens, which can be caused by its antigenic changes and violations of the helper-suppressor relationships of cellular immunity, have been noted [39].

Today there is a big problem of PVSINE caused by pseudo-exfoliative syndrome (PES): it is characterized by the development of cataracts [40], glaucoma [41] and weakly ligamentous apparatus of the lens; PES and its fluctuations are associated with geographic and hereditary factors, occurs in 30% of people over 50 years of age and the frequency of glaucoma in PES is 6 times higher than in a similar population without uveopathy, that is, PES [42].

It is important to emphasize that at present the population is experiencing an increased burden on vision. Back in 2010, there were 285 million people with visual impairments in the world, of which 39 million people are affected by blindness [43], about 330% of the world's population is myopic [44]. Among PVSINE, the incidence of myopia has significantly

increased over the past 50 years, about 1.6 billion people suffer from myopia [45]. Myopia acquires an epidemiological character of development during schooling (80-90%), of which 10-20% is high myopia [46].

In the structure of PVSINE, age-related diseases are sharply increasing, of which age-related macular degeneration (AMD) is the most significant influencing the quality of life. Epidemiological studies of AMD showed the following: \* 7-8% of the world population suffer from AMD, the approximate number of cases in the world by 2020 is 196 million people and will increase to 288 million in 2040 [47]; among patients with AMD, the incidence of glaucoma is 5.4% [48]; \* AMD and glaucoma are currently the main causes of irreversible vision loss; with an increase in life expectancy and the number of elderly people in the structure of the population, the prevalence of these pathologies also sharply increases. According to UN forecasts, by 2050, the proportion of people over 60 years old will double: from 11.7% to 21.1% of the world population [49, 50].

Socially significant eye diseases (cataract, glaucoma, diabetic retinopathy, AMD) are characterized by regional, geographic, national and epidemiological characteristics, namely: 1) the most common PVSINE in the USA [51]; 2) in China, the high incidence of cataract, glaucoma, AMD is the main cause of disability [52]; 3) AMD, cataract, diabetic retinopathy (DR) and glaucoma are considered the main causes of "endpoints" of ophthalmopathologies in the Swedish population [53]; 4) in Poland, the proportion of patients with cataracts at the population level is maximum - 20.14% [54] and other diseases accounted for: AMD - 4.33%, glaucoma - 8.13%, diabetic retinopathy - 1.7%; 5) among the Finnish population, AMD was found in 3.8% of cases [55], in Nepal - 38.4% [56] and was higher in Caucasians than in neuropoids and African Americans [57, 58, 59].

Thus, it follows from the presented data that PVSINE in all countries of the world and populations is not only highly common pathologies, but also severe eye diseases that occur in various clinical variants in people of different ages, including newborns [60]. These alarming facts in all countries of the planet should prompt researchers on all continents to conduct epidemiological studies of these diseases. The epidemiology of PVSINE is extremely important for the development of national and public health strategies [61].

The attention of researchers is also directed to herpetic keratitis (HK), which remain an urgent problem of science and practice: \* the annual number of HK in the United States is 500 thousand and in the world - up to 10 million [62]; more than 60% of corneal blindness in the world is associated with HK [63]. This issue in an epidemiological study (the total volume was 5947 observation units) was studied by K.B. Allayorov. (2004) among the population of the Aral Sea region, and the results obtained certainly deserve special attention. The fact is that the region studied in the work is characterized by its status as a cut out agrarian zone and the population in this area of the Aral Sea region has a specific (endemic) hygienic, geographic and toxicological characteristic of the workplace. It is noted that

in this group of the population, HK occurs with a frequency of 75% and among the risk factors, the leading ones were "conditions with various infections", from the factor "social category" - "workers", from the factor "age" - "age group over 40 years old" and from the factor "gender" - "men" [64].

In the conditions of the sharply continental climate of the Fergana Valley of Uzbekistan, we have studied the clinical, meteorological and geographical features of the formation of glaucoma using a large amount of material. It turned out that glaucoma in the studied region is characterized by a high prevalence and specific epidemiological characteristics: \* glaucoma progresses depending on the meteorological factors of the region and is often manifested by meteorological reactions; Glaucoma control requires new advanced developments based on weather forecasting and meteorological prophylaxis of glaucomatous professionals.

In addition, we studied the features of the formation and clinical course of keratitis with the development of an advanced innovative prevention technology in this region. A comprehensive clinical and meteorological study was carried out in 1705 patients with keratitis: \* for the first time developed, studied and tested the method of epidemiological and clinical and meteorological observation of patients with keratitis; \* revealed the features of the formation and pathomorphosis of the clinical course of keratitis in a sharply continental climate; \* for the first time developed and introduced into practice a new and perfect technique with bioclimatograms; \* prerequisites and practical foundations have been created for the implementation of prophylaxis methods - keratitis and other PVSINE in the conditions of the Fergana Valley among various strata of the population, including the elderly, senile and long-livers [65].

Thus, the presented analysis of the literature and our own materials clearly indicate that eye diseases of infectious and non-infectious etiology today are extremely serious problems of modern ophthalmology, domestic preventive medicine and practical health care. A huge stream of clinical studies in the study of the problem of PVSINE continues, but, despite the significant number of these studies, the risk factors and etiopathogenesis of these diseases remain not fully understood.

In the early recognition of PVSINE, different types of clinical trials play an insufficient role; their use in dynamic observation of patients is largely insufficient, ineffective and economically unprofitable. In this regard, the "intervention" of the epidemic and the threat of PVSINE for the modern population of the whole world does not subside until now. In this regard, the main task of modern science is to provide public health services with true epidemiological data on the incidence of PVSINE and "end points" from them for the development of transmitted, innovative, regional programs to combat them.

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