

## **PREVENTIVE MEDICINE: THE CURRENT STATE AND PROSPECTS**

DOI <https://doi.org/10.30525/978-9934-26-113-8-42>

### **MYOPIA AND CAUSES OF ITS OCCURRENCE**

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The concept of myopia.

During the growth of the eyeball changes its shape, convexity of the cornea and lens and up to 9-12 years, the relationship between the refractive power (optical component) and the length of the axis (anatomical component). If in the process of eye formation the correspondence between optical and anatomical components is established, then normal (emetropic) refraction develops [13]. However, there are cases of non-compliance of refraction with the norm, among which we can distinguish myopia.

Myopia is one of the most common vision disorders. People with myopia close their eyes to «sharpen» and see something in the distance [3, 5]. Myopia is a visual defect in which objects are clearly visible nearby and poorly (in the form of a blurred image) – in the distance. More than 30% of all inhabitants of our planet suffer from myopia (in some countries, for example, in Japan, this indicator exceeds even 60%).

In a person with good vision, the image is focused on the retina (as it should be). But with myopia, the focus is in front of the retina, which leads to blurred vision. The reason may be an elongation of the eyeball or a change in the refractive power of its optical system (cornea or lens). Many people have both of these disorders at once [1, 4].

Thus, myopia is a refraction during which parallel rays coming from distant objects intersect in front of the retina and do not reach it. This refraction may be due to the longitudinal axis of the eye being too long (more than 22.5-23.0 mm) or greater than the normal refractive power of the eye. In myopia, glasses with scattering biconcave lenses are prescribed, which reduce the refraction of rays and focus the image of the object on the retina [6, 11].

#### Causes of myopia.

During childhood, this type of refraction, such as hyperopia, predominates. The frequency of normal refraction and myopia is very low. In subsequent age periods, hyperopia occurs less frequently, and emetropia and myopia more often. During schooling, the number of miopic children increases 5 times from school entry to graduation. Lack of light significantly affects the formation and progression of visual impairments in school-age children. Visual acuity and resistance to clear vision in students are greater at the beginning of lessons and weaken by the end of them. The attenuation is sharper the lower the light level. An important factor that reduces visual acuity, development and progression of myopia in students during school (even with sufficient levels of lighting in classrooms and endurance within the normative limits of other parameters of light factors) is the workload, its duration during the day [8, 9].

Significantly expressed in children and adolescents is the relationship between the frequency of myopic refraction, the state of phosphorus-calcium metabolism and the duration of daily exposure to ultraviolet radiation. Phosphorus-calcium metabolism is disturbed in children who have little or no walks at noon, when the intensity of ultraviolet radiation is high enough. This results in changes in the tone of the eye muscles. Weakness of these muscles at high visual load and insufficient light causes the development of refraction anomalies and their progression [2, 10].

The first signs of myopia may be a student's complaint that he has begun to have difficulty seeing what is written on the board. When he reads, he raises the book close to his eyes, tilts his head sharply while writing, squints his eyes while examining objects.

Myopia usually develops under the influence of long and chaotic work at close range without following the hygienic norms of reading or writing. Rickets, tuberculosis, rheumatism and other common diseases can create a favorable ground for the development of myopia [10].

#### Degrees of myopia.

Myopic refraction from 3.25 D and above at visual acuity with correction from 0.5 to 0.9 is the basis for enrollment of children and adolescents in III and IV health groups, i.e. patients. For any visual abnormalities in children and adolescents (except for catheter vision, acuity, light perception, field of vision and other changes), they need close attention of an ophthalmologist and strict

adherence to all his prescriptions at school and at home [5, 6]. Given the degree of visual acuity loss (measured in diopters) distinguish myopia:

– weak – less than 3.0 diopters (determined in about 82% of subjects). It is characterized by an increase in eye length by 1-1.5 mm. With such a violation of refraction, a person sees the outlines of distant objects a little blurry;

– average – 3.25-6.0 diopters (determined in about 12% of subjects). It is characterized by elongation of the eyeball by 1-3 mm. At this stage, the membranes and vessels of the eye undergo changes, stretch and thin. Vision in the distance is reduced, and nearby a person sees clearly and distinctly at a distance of only 20-30 cm;

– high – more than 6.0 diopters (determined in about 6% of subjects). It is characterized by an increase in the length of the eyeball by 3 mm or more. This threatens a significant thinning of the retina and vascular membranes of the eye and a significant reduction in visual acuity up to 30 D and more [5].

With mild to moderate myopia, hyperopia, astigmatism, the doctor should examine students once a year, and with high myopia (more than 6.0 D) twice.

According to various criteria, myopia is divided into several types. If it is associated with congenital anomalies of the eyeball, it is congenital myopia. Rare – in 2% of cases, the child is born with an enlarged (compared to normal) eyeball. In the vast majority of cases, myopia appears at school age. Defects in the synthesis of connective tissue protein (collagen), necessary for the structure of the sclera, are inherited. Weakening of the scleral tissue leads to an increase in the size of the eyeball and, as a consequence, to the development of myopia. If both parents are short-sighted, the risk of developing myopia in a child is 80%, if one – 40%. In other cases, it is an acquired myopia [5, 7].

If vision deteriorates by more than one diopter per year, it is progressive myopia that requires special attention and treatment. Myopia progresses most intensely in children during the school years, when visual loads are particularly high.

Myopia can be true, ie caused by the structure of the eye, and false – when vision deteriorates due to accommodation disorders, and anatomical changes – elongation of the eyeball – does not occur [9, 12].

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