



*Original Contribution*

**PREVALENCE AND CONTROL OF MYOPIA AMONG CHILDREN  
IN PLEVEN, BULGARIA**

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**ABSTRACT**

**Purpose:** To observe the factors affecting the prevalence and control of myopia among children in Pleven, Bulgaria. **Methods:** A retrospective study was done. From March 2019 to March 2021, 404 consecutive patients from 3 to 18 years old with the main diagnosis myopia after cycloplegia passed through the private ophthalmology practice. The following signs were analyzed: age, sex, location, type and degree of myopia, review result and accompanying diseases. **Results:** The demographic profile of the evaluated children was: 43.8% males and 56.2% females ( $p < 0.05$ ); most of them are living in the city (89.2%). The most significant number of children with myopia were between 9 and 12 years old. Children with new onset myopia were 27.7% and 72.3% were with existing one. Patients between 8 and 18 years of age with existing myopia are more than those with new onset one ( $p < 0.05$ ). There were 76.7% children with a low degree of myopia, 17.6% with a medium degree and 2.0% with a high degree. Without accompanying diseases were 65.6% of our patients. **Conclusion:** The control and treatment of myopia seem promising. However, it is necessary to develop a state policy for the prevention of children's eye health in Bulgaria.

**Key words:** nearsightedness, age, incidence, prevention

**INTRODUCTION**

Myopia (nearsightedness) is a refractive error which frequency is increased worldwide. People with myopia are predicted to be raised from 1.4 to 4.8 billion according to the temporal global trends from 2000 through 2050 (1). The evidence suggested that the major role in this rise in children had the presence risk factors like parental myopia, reading or writing distances, time spent on studying, hours of sleeping (2). Nowadays the environmental risk factors for myopia are become more prevalent. In Asian populations are reported epidemics of myopia in young people, possibly

attributed to the near-work demands imposed by more intensive education (3). In recent years the prevalence of myopia in the young adolescent population has also increased in Caucasians (4, 5). Early onset of myopia in childhood is presented with a longer duration of the disease, higher progression and carries the risk of reaching high-grade myopia and its complications (presenile cataract, glaucoma, retinal detachment, macular degeneration) (6, 7).

The clinical picture in myopia is a blurred vision for far. Nearsightedness can be treated by corrective concave lenses (spectacles or contact lenses) in children and adolescents or refractive surgery in older patients (8). Refractive errors, especially if left uncorrected, can affect school success, reduce employment, and impair quality of life (9).

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Due to its high frequency, and the risk for eye health in case of early onset or high degree, myopia has gained importance in epidemiological studies. The consequences of having myopia or some of its complications have significant socio-economic importance. To date only a few studies have been carried out to estimate the epidemiology of myopia among the Balkans children.

The aim of this study is to observe the factors affecting the incidence and control of myopia among children (aged 3–18 years) in Pleven, Bulgaria.

## MATERIALS AND METHODS

A study of patients in a private ophthalmology practice "Topvision- Dr. E. Krivoshiyska" was made over a period of 2 years. The mainly examined populations in the office are children as the doctors there are focused on pediatric ophthalmology. Inclusion criteria were patients from 3 to 18 years old with the main diagnosis myopia with or without accompanying astigmatism and/or exophoria. Exclusion criteria were patients with amblyopia with or without manifest strabismus, ptosis, microphthalmia, craniostenosis, iris and choroid coloboma, persistent hyaloid artery, hypopituitarism, trisomy, Marfan's syndrome.

After a retrospective review of the outpatient sheets between March 2019 and March 2021, we found that 4091 patients passed through the doctor's office. From them, the listed enrollment criteria were met by 404 consecutive patients with myopia. We used the definition of myopia which is spherical equivalence  $-0.5$  diopters (D) or greater (10). In all of the patients, the measurement of the refractive error was made after cycloplegia, done with twice installation in each eye of Cyclopentolate drops with 30 minutes intervals. Refractive status was detected by autorefractometry with auto refractometer Topcon RM-8900. To the patients with newly discovered myopia were prescribed glasses for the first time after the exam. These one who had existing myopia were prescribed or not new glasses according to the visual acuity (vis) check. If the

visual acuity was low (vis<0.8) with their present spectacles - new one were prescribed. If the visual acuity was best corrected (vis=1.0) with their present spectacles- the same glasses stayed.

The following signs were analyzed:

- gender (boys; girls)
- location (city; village)
- age (between 3 and 18 years)
- type of myopia: new onset / existing
- review result: new correction / same correction
- degree of myopia: low (up to -3.0 D), medium (between -3.0 and -6.0 D) and high (above -6.0 D) (10)
- accompanying diseases: astigmatism and/or exophoria

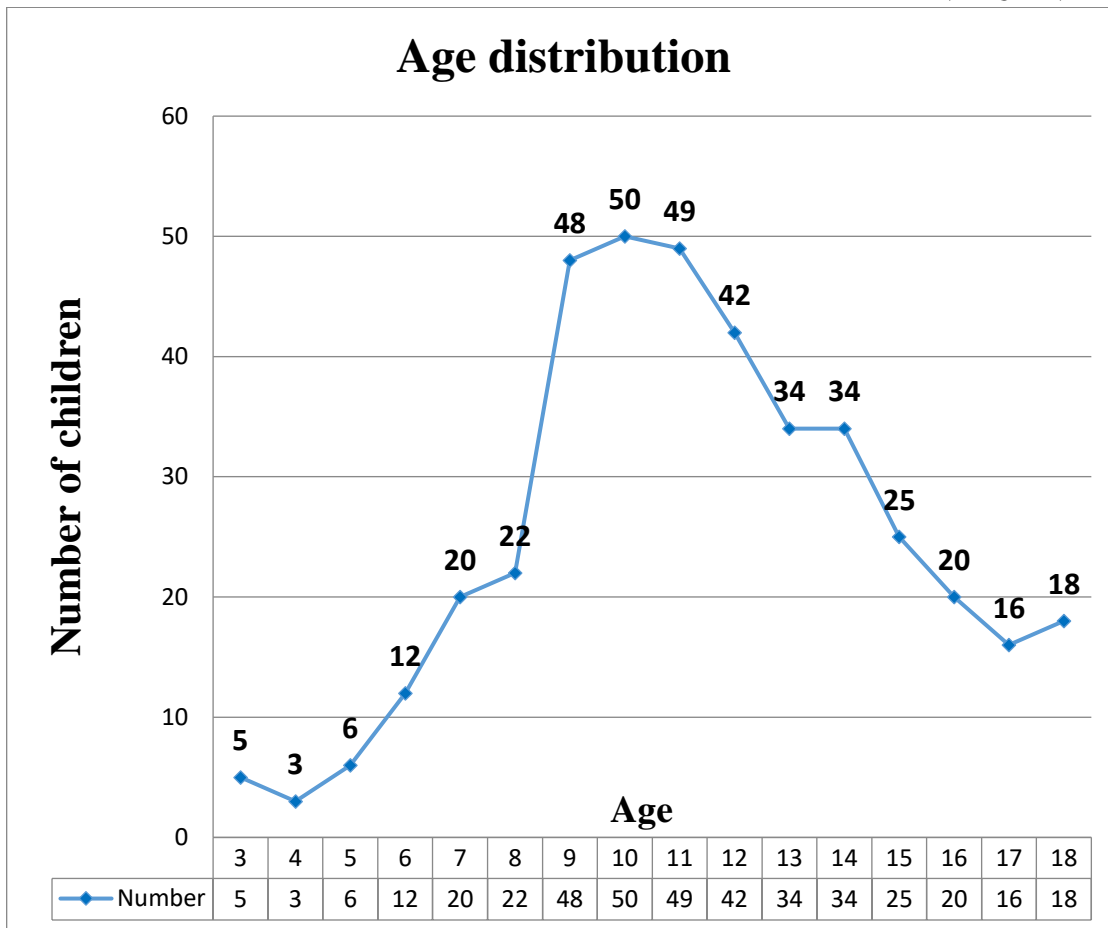
The study data were statistically processed using Microsoft Excel 2010 and Statgraphics Software 2.0.0.0. Statistical analyses were performed with a Chi-square test and Student's t-test. A  $p < 0.05$  was considered significant.

## RESULTS

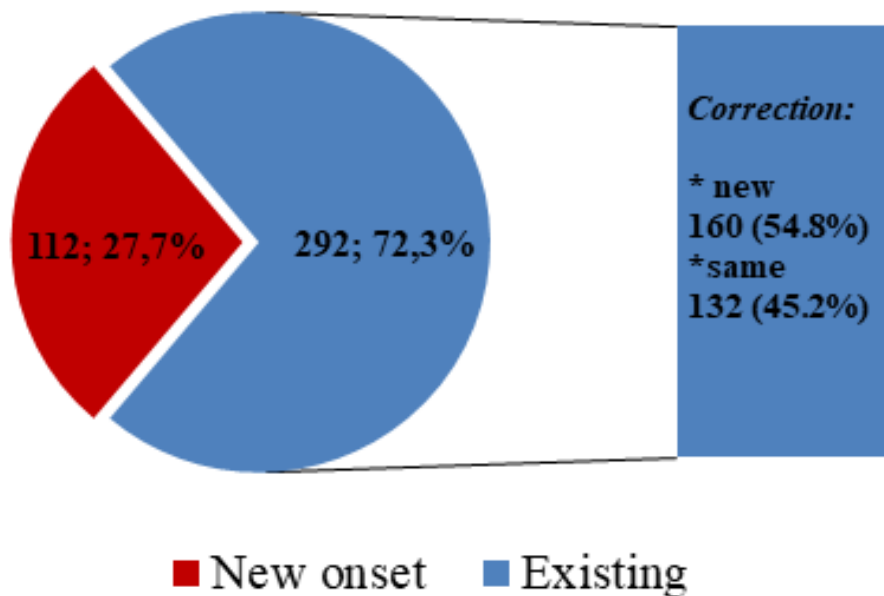
Of the 4091 patients, 404 (9.9%) of the children had main diagnosis of myopia. The demographic profile of the evaluated children was: 117 (43.8%) males and 227 (56.2%) females ( $t=2.12$ ,  $p < 0.05$ ); 157 (89.2%) children living in the city and 19 (10.8%) in the village. The number of children with myopia according to their age is shown on **Figure 1**.

We found 112 (27.7%) children with new onset myopia and 292 (72.3%) with existing one. From these 292 patients with existing myopia, 160 (54.8%) were needed new glasses and 132 (45.2%) had the same correction (**Figure 2**).

On **Figure 3** is presented the number of patients according to their age and the type of myopia. Children till the age of 7 with new onset of myopia are not significantly differ from those with existing one ( $\chi^2=1.953$ ,  $df=1$ ,  $p=0.1622$ ) unlike patients between 8 and 18 years of age ( $\chi^2=15.456$ ,  $df=1$ ,  $p=0.0001$ ).



**Figure 1.** Age distribution of the children with myopia



**Figure 2.** Type of myopia and examination result

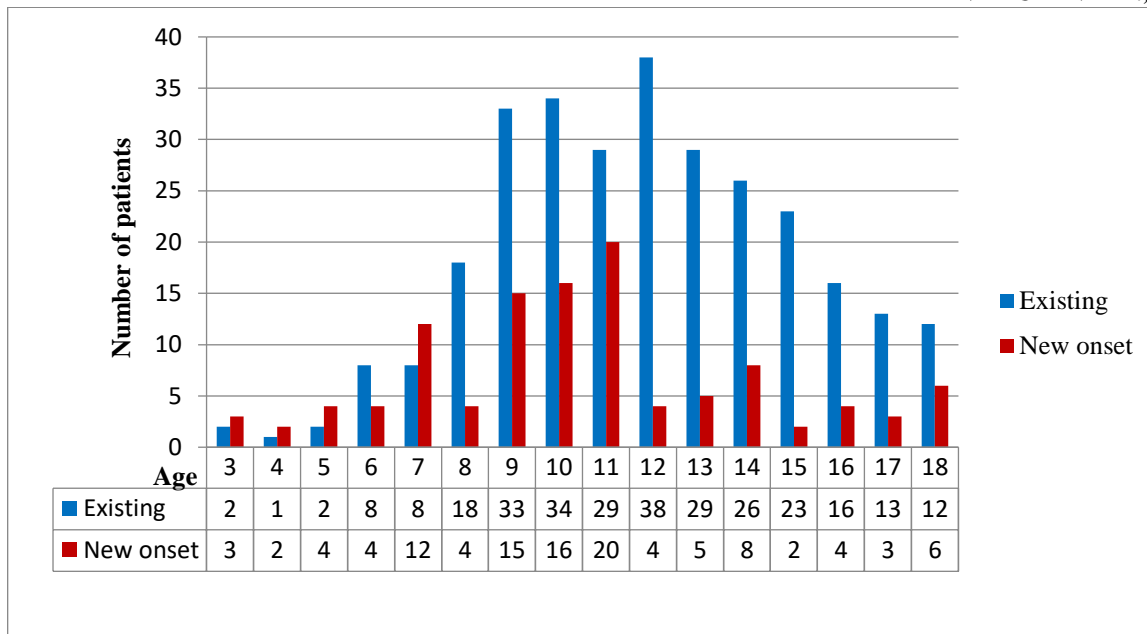


Figure 3. Number of patients according to their age and the type of myopia

During the examination of the refraction of our patients there were 310 (76.7%) children with low degree of myopia, 71 (17.6%) with medium

degree and 8 (2.0%) with high degree. We didn't have information about the diopter power of the spectacles in 15 (3.7%) of our patients (Figure 4).

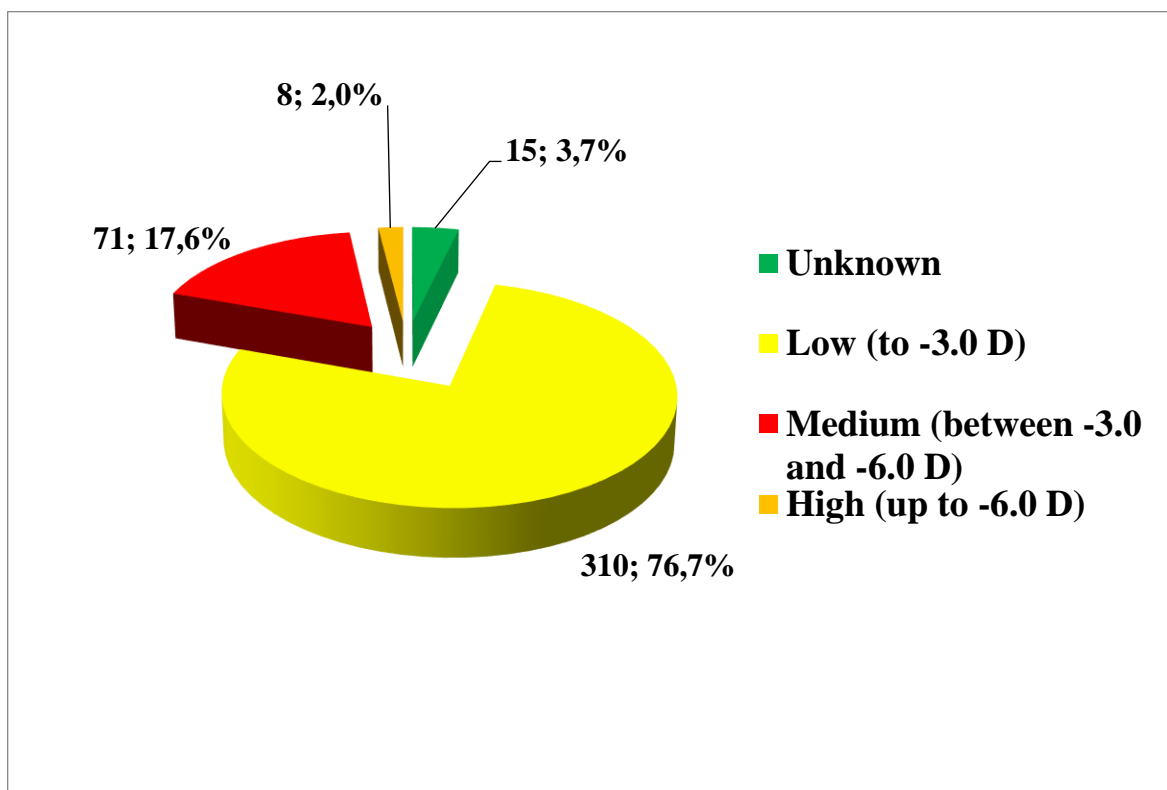


Figure 4. Distribution of the patients according to the degree of myopia

Apart from myopia accompanying diseases had 139 (33.4%) children. From them 90 (64.7%) were with astigmatism and 49 (35.3%) – with exophoria. Without accompanying diseases were 265 (65.6%) of our patients.

## DISCUSSION

In the literature considerable variation in prevalence of myopia among children of different locations, ethnic groups, and age are found. Among 5 to 17 year old children Asians had the highest incidence of myopia (18.5%), followed by Hispanics (13.2%), African Americans (6.6%) and whites (4.4%) (11). In our study we found 9.9% frequency of myopia which corresponds to that of the European race, which varies between 8.3 and 17.7% (12). Plainis et al. (13) compared the prevalence of myopia (without cycloplegia) in 10 to 15 year olds in Greece (Heraklion) and Bulgaria (Stara Zagora) and found that the incidence was 37.2% and 13.5%, respectively. Compared with our result the higher percentage in their study among the Bulgarian population is probably due to the fact that the examination of refraction was done without cycloplegia. It is proved that cycloplegic refraction is the gold standard for epidemiological studies on refractive errors (9).

We found a statistical significant ( $p < 0.05$ ) lower prevalence of myopia among boys than girls (43.8% vs 56.2%). The observed gender differences are reported from other authors (13,14). One possible explanation of this finding would be that boys spend more time outside each day than girls which reduces the incidence of myopia in children (15, 16). On the other side girls tend to read more, at least at school level and the prolonged near work is a risk factor for inducing myopia (9, 17).

The incidence of myopia is depended of the children age. In the majority of refractive error studies is reported about a 5 to 8 times increase in prevalence rates between 6 year and 12 year-old children (14,15,18,19). A similar relationship was observed in the present study, with the most significant number of children with myopia in those aged between 9 and 12 years.

It is noteworthy that the newly onset myopia is more common in children till 7 years though the

observation is not statistically significant ( $p > 0.05$ ). After this age, the existing myopia is significantly higher than in the newly diagnosed cases ( $p < 0.05$ ). This indicated good information and health culture of the parents and general practitioners who cared for the eye health control in children although there is no preventive program for this in Bulgaria.

From the examined children in our study 27.7% were with new onset myopia and 72.3% wore spectacles correcting myopia. In compare in the study of Plainis et al. (13) from 2009 where Bulgarian pupils wearing spectacles at school were found to be 8.7%, there is seen a positive trend and nowadays in our country the percentage of the children wearing glasses is more. From these of our patients with existing myopia, almost half of them have appropriate correction without need of change. Because of the presence of frequent screening and follow up, all of our patients have adequate prescription of myopic glasses after cycloplegia.

In our study 94% of the patients have low and moderate degree of myopia, which allows, with adequate correction and strict monitoring, to prevent potential progression and complications of myopia. Although the percentage of high degree of myopia in the different studies is low, the prevalence of myopia above -6.0 D in 18 years of age children increased worldwide (8, 20). It is predicted that in 2050 half of the global population (about 5 billion people) would be myopic, and one fifth of those (about 1 billion) would be with high degree of myopia (21). This requires cases of high-grade myopia to be diagnosed on time and followed-up for complications.

Limitation of our study is that the observation was done to children in a single private practice in one town and it is not possible to make any conclusions regarding myopia prevalence and control in children at a national level. The findings should be considered as being only indicative in the study population. There is a need for research which was obtained using random sampling techniques.

## CONCLUSION

Myopia is one of the most common disorders of the eye. The epidemiology studies shows that the

prevalence is increasing rapidly alarmingly in East Asia's, and it will be spreading in more countries in the future. The control and treatment of myopia seems promising. However not only the treatment of myopia is important, but also the profilaction of it. Therefore it is necessary to develop a state policy for the prevention of children's eye health in Bulgaria.

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