ROLE OF GENDER IN THE OCCURRENCE OF REFRACTIVE ERRORS

ROLA PŁCI W WYSTĘPOWANIU WAD REFRAKCJI

DAMIAN CZEPITA, ARTUR MOJSA, MARIA USTIANOWSKA, MACIEJ CZEPITA, EWELINA ŁACHOWICZ

Material and methods: 5865 children from elementary schools, junior high schools and high schools were examined (2845 boys, aged 6−18 years, mean age 11.4, SD = 3.0 and 3020 girls, aged 6−18 years, mean age 11.9, SD = 3.3). The examined students were Caucasian and resided in and around Szczecin, Poland. The examination included retinoscopy under cycloplegia. The refractive error readings were reported as spherical equivalent (SE). Myopia was defined as SE of at least -0.5 D, hyperopia as SE of at least +1.0 D. Astigmatism was diagnosed when the difference in the refraction of axes in one eye was > 0.5 DC. Data analysis was performed using χ² test. P values of less than 0.05 were considered statistically significant.

Results: It was found that myopia occurs more frequently in girls (7.4%) than in boys (5.1%) – p < 0.001. Hyperopia occurs more frequently in boys (19.6%) than in girls (18.2%) – p < 0.001. A slightly higher prevalence of astigmatism in girls (1.9%) than in boys (1.5%) was also observed (p > 0.05).

Conclusions: Gender influences the occurrence of myopia and hyperopia in schoolchildren ranging from 6−18 years of age.

Key words: gender − refractive errors.

Introduction

Based on recent studies a higher prevalence of myopia was found [1, 2, 3, 4]. Most authors conclude that myopia occurs more frequently among girls [3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15] than in boys [16], although some authors did not observe in their studies the influence of gender on the occurrence of myopia [17, 18, 19, 20, 21, 22].
The prevalence of hyperopia in schoolchildren drops with age [1, 4, 23]. It was observed that hyperopia occurs more often in boys [6, 10, 11, 16, 21] than in girls [7, 13]. In a few papers though the influence of gender on the occurrence of hyperopia was not described [9, 18, 20, 22, 23].

Opinions concerning the prevalence of astigmatism vary among authors. In some publications astigmatism is said to be more frequent among girls [13, 20, 21, 22] and in others it is said to be more frequent among boys [6, 9, 10, 11, 24].

Along with the increase of the amount of near work done by children (reading, writing, working on a computer) all studies concerning the development of the eye as well as the occurrence of refractive errors are of great social importance in understanding.

Despite all the scientific significance, to date only a few papers dealing with the prevalence of refractive errors among boys and girls have been published in the world [5, 7, 8, 11, 12, 13, 14, 15, 16, 18, 19] and in Poland [6, 9, 10, 17, 20, 21, 22, 23, 24].

That is the reason why we decided to study more closely the role of gender in the occurrence of refractive errors in schoolchildren ranging from 6–18 years of age.

**Material and methods**

5865 children from elementary schools, junior high schools and high schools were examined (2845 boys, aged 6–18 years, mean age 11.4, SD = 3.0 and 3020 girls, aged 6–18 years, mean age 11.9, SD = 3.3). The examined students were Caucasian and resided in and around Szczecin, Poland.

Participation was voluntary and informed consent was obtained from the school principals and parents of all schoolchildren. The studies were approved by the Bioethics Committee of the Pomeranian Medical University in Szczecin. The research protocol adhered to the provisions of the Declaration of Helsinki for research involving human subjects.

The children were examined in the school’s consulting rooms. The examination included retinoscopy under cycloplegia. Cycloplegia was induced with two drops of 1% tropicamide administered 5 minutes apart. Thirty minutes after the last drop, pupil’s dilation and the presence of light reflex was evaluated as later retinoscopy was performed. Retinoscopy was performed in a dark room and all schoolchildren were examined by two doctors (AM, MU).

The refractive error readings were reported as spherical equivalent (SE) – sphere power plus half negative cylinder power. Myopia was defined as SE of at least -0.5 D, hyperopia as SE of at least +1.0 D. Astigmatism was diagnosed when the difference in the refraction of axes in one eye was > 0.5 DC. Both eyes were examined, but only data gathered from the right eye were analyzed.

Data analysis was performed using χ² test. P values of less than 0.05 were considered statistically significant.

**Results**

It was found that myopia occurs more frequently in girls (7.4%) than in boys (5.1%) – p < 0.001. Hyperopia occurs more frequently in boys (19.6%) than in girls (18.2%) – p < 0.001. A slightly higher prevalence of astigmatism in girls (1.9%) than in boys (1.5%) was also observed – p > 0.05 (fig. 1, tab. 1).

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**Discussion**

Proving the influence of gender in the occurrence of refractive errors in schoolchildren is a difficult task, because of small differences between groups of boys and girls. In order to overcome this problem the studies should be carried out on a very large population of children. In our paper we examined 2845 boys and 3020 girls. We conducted our studies using an objective method of retinoscopy under cycloplegia. The investigations were performed by two doctors.
According to Zadnik et al. [25] 95% limits of agreement for cycloplegic retinoscopy are ± 0.95 D.

In the performed investigations we confirmed what most authors realize, that myopia occurs more frequently among girls than in boys [3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15] and that hyperopia occurs more frequently in boys than in girls [6, 10, 11, 16, 21]. It is believed that this trend is linked to the influence of puberty and earlier maturation typically found in girls [4].

We also found that astigmatism has a slightly higher occurrence rate in girls than in boys, which is in accordance with the opinions of many other authors [13, 20, 21, 22].

Our data is similar to the results of investigations performed in Finland [8], Hong Kong [16], India [14], Israel [13, 15], Malaysia [7], Singapore [11, 12], Taiwan [5]. Our data is also similar to the results of papers published in Poland by Czerek-Jaguziańska et al. [6] and Ogielska et al. [10], however different from the results gathered by other Polish authors such as: Czepita et al. [17, 23, 24], Miratyńska-Rusinowa [9], Muszyńska-Lachota et al. [20], Orlikowska [21], Szwaykowski and Wilk [22]

Most probably this is the result of using in our studies spherical equivalents for the right eye in order to calculate the power of the refractive errors. However, it is currently thought that this form of data analysis is more accurate [26].

Conclusions

Gender influences the occurrence of myopia and hyperopia in schoolchildren ranging from 6–18 years of age.

References