Myopia and outdoor sports in university students of Mendoza, Argentina

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Received: April 10th, 2021.
Accepted: May 14th, 2021.

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Oftalmol Clin Exp (ISSN 1851-2658)
2021; 14(2): 96-101.

This submission has not been published anywhere previously and it is not simultaneously being considered for any other publication.

Conflict of interest
None of the authors have any proprietary interests or conflicts of interest related to this submission.

Financial support
None.

Abstract

Purpose: To assess the prevalence of myopia in university students from Mendoza, Argentina.
Methods: This was a cross-sectional study of randomly recruited subjects from the National University of Cuyo, Mendoza, Argentina. Myopia was defined as uncorrected vision lower than 8/10 tested with decimal scale Snellen visual acuity charts and simultaneously as a spherical equivalent refractive error of -1,00 D or worse in right eyes, measured with autorefractometry without cycloplegia. The subjects answered a questionnaire about their sports activities.
Results: The present study involved 2299 students with an average age of 24.65 ± 7.87 years, of which 1562 (67.94%) were females. In total, 1613 (70.16%) subjects had an uncorrected visual acuity equal or greater than 8/10, that is, only 29.84% may have had clinically significant myopia or astigmatism (or other less common refractive errors). In total 1042 (45.32%) said they wore glasses, but only 603 (26.23%) had brought them. Of those who said they used correction (brought or not), 710 (30.88%) had myopia of -0.50D or less in the autorefractometry, 553 (24.05%) had myopia

worse than -1.00D, 133 (5.79%) had astigmatism worse than -2.00D. Among the three groups who "did not practice sports", or practiced "indoor" or "outdoor sports", visual acuity below 8/10 was present in 27.58%, 24.88% and 19.88% respectively.
Conclusion: The prevalence of myopia defined as visual acuity lower than 8/10 or as non-cyclo autorefractometry of -1.00D or worse, was close to 25% in this Latin-American population.
Keywords: myopia, refractive epidemiology, uncorrected visual acuity, university students.

Miopía y deportes al aire libre en estudiantes universitarios de Mendoza, Argentina

Resumen

Objetivos: Evaluar la prevalencia de miopía en estudiantes universitarios de Mendoza, Argentina.
Métodos: Se trata de un estudio transversal de sujetos reclutados al azar en la Universidad Nacional de Cuyo, Mendoza, Argentina. La miopía se definió como la visión no corregida inferior a 8/10 evaluada con tablas de agudeza visual Snellen en escala decimal, y también como un error refractivo con equivalente esférico de -1,00 D o peor, medido con autorrefractometría sin cicloplejía. Los sujetos respondieron a un cuestionario sobre sus actividades deportivas.
Resultados: En el presente estudio participaron 2299 estudiantes con una edad media de 24,65 ± 7,87 años, de los cuales 1562 (67,94%) eran mujeres. En total, 1613 (70,16%) sujetos tenían una agudeza visual no corregida igual o superior a 8/10, es decir, sólo el 29,84% podía tener miopía o astigmatismo clínicamente significativos (u otros errores refractivos menos comunes). En total, 1042 (45,32%) dijeron que llevaban anteojos, pero sólo 603 (26,23%) los habían traído. De los que dijeron que usaban anteojos (traídos o no), 710 (30,88%) tenían una miopía de -0,50D o menos en la autorrefractometría; 553 (24,05%) tenían una miopía peor que -1,00D; 133 (5,79%) tenían un astigmatismo peor que -2,00D. Entre los tres grupos que "no practicaban deportes" o que practicaban "deportes de interior" o "de exterior", la agudeza visual menor que 8/10 estuvo presente en el 27,58%, el 24,88% y el 19,88% respectivamente.
Conclusiones: La prevalencia de miopía definida como agudeza visual inferior a 8/10 o como autorrefractometría sin cicloplejía de -1,00D o peor fue cercana al 25% en esta población universitaria latinoamericana.
Palabras clave: miopía, epidemiología refractiva, agudeza visual no corregida, estudiantes universitarios, deportes.

Miopia e esportes ao ar livre em estudantes universitários de Mendoza, Argentina

Resumo

Objetivos: Avaliar a prevalência de miopia em estudantes universitários de Mendoza, Argentina.
Métodos: Este é um estudo transversal de indivíduos recrutados aleatoriamente na Universidade Nacional de Cuyo, Mendoza, Argentina. Miopia foi definida como visão não corrigida menor que 8/10 avaliada com tabelas de acuidade visual Snellen em escala decimal, e também como erro refrativo com equivalente esférico de -1,00 D ou pior, medido com autorefratometria sem cicloplegia. Os sujeitos responderam a um questionário sobre suas atividades esportivas.
Resultados: participaram do presente estudo 2.299 alunos com média de idade de 24,65 ± 7,87 anos, sendo 1562 (67,94%) mulheres. No total, 1.613 (70,16%) indivíduos apresentavam acuidade visual não corrigida igual ou superior a 8/10, ou seja, apenas 29,84% poderiam ter miopia ou astigmatismo clinicamente significativo (ou outros erros de refração menos comuns). No total, 1.042 (45,32%) afirmaram usar óculos, mas apenas 603 (26,23%) os trouxeram. Dos que afirmaram usar óculos (trazidos ou não no momento do estudo), 710 (30,88%) apresentaram miopia de -0,50D ou menos na autorefratometria; 553 (24,05%) tiveram miopia pior que -1,00D; 133 (5,79%) tinha astigmatismo pior que -2,00D. Entre os três grupos que "não praticavam esportes" ou que praticavam "esportes indoor" ou "outdoor", a acuidade visual menor que 8/10 estava presente em 27,58%, 24,88% e 19,88%, respectivamente.
Conclusões: A prevalência de miopia definida como acuidade visual inferior a 8/10 ou como au-

torefratometria sem cicloplegia de -1,00D ou pior, foi próxima a 25% nesta população universitária latinoamericana.
Palavras chave: miopia, epidemiologia refrativa, acuidade visual não corrigida, estudantes universitários, esportes.

Introduction

Refractive errors are the principal cause of avoidable vision impairment worldwide[1]. Among refractive errors, myopia has been increasing prevalence in highly developed urban environments of East and Southeast Asia due to a combination of high academic load since early kindergarten school years and low outdoor exposure to natural light[2]. The study of refractive error prevalence in Latin America began with a seminal study in children aged 5-15 years in La Florida, Chile, where the Andean population presented a low prevalence of myopia (under 10%), but a high prevalence of astigmatism over -2.00 diopters[3]. Then, two studies reported the prevalence of myopia in adults in Argentina, one in office workers of Buenos Aires city[4] and the other in a rural city (Villa María, Córdoba) (29.2% and 13.5% prevalence of myopia, respectively)[5]. Later, a study in Brazil reported a 19.3% prevalence of myopia for 17-18 years old adolescents[6]. Salomao *et al*. reported a prevalence of myopia of 4.5% in 11-14 year old children in San Pablo, Brazil[7], and Signes-Soler *et al*. reported a 0.5% prevalence of myopia in schoolchildren from Paraguay[8].

Yet, it is not known which is the prevalence of myopia in Latin American's university student populations, more prone to develop myopia because of their high academic achievement. The study in Buenos Aires office workers included a population of adults engaged in 6 years of university studies[4], uncommon for a country with only 20-30% of the population reaching this level[9], and in that case the prevalence of myopia was higher than in the rural city of Villa Maria[5]. The present cross-sectional study was developed to report the prevalence of myopia and astigmatism in an urban population of university students from Mendoza Province, in Argentina.

Material and methods

This study was carried out at the National University of Cuyo, Mendoza (Argentina) in October and November 2019. A campaign about vision was carried out from the initiative of La Piramide Optics in Mendoza. This city is the fourth most populated urban environment in Argentina with 1,2 million inhabitants. Although being a Latino population in South America, Argentinian ethnicity differs from its neighbors as it has 80% European ancestry[10]. The National University of Cuyo had 35,621 matriculated students in 2019, of whom 62.12% were women[9, 11].

The study consisted of interviews among unselected students at the university campus, recruiting them randomly. They were attracted by a campaign about general visual health care announced in the University bulletin. The campaign provided information on vision care against UV and infrared radiation, the use of solar filters, and also on the need for blinking frequently for daily work on screens. Volunteers performed a brief interview in which the methods were described and verbal informed consent was obtained. Then a questionnaire on daily activities was answered, and finally visual acuity was tested and dry autorefractometry was performed. Visual acuity charts and autorefractors were installed in boxes for this purpose in the hallways of buildings at the university campus. Subjects were interested in the campaign and collaborated eagerly.

Uncorrected visual acuity was studied in each eye with Snellen decimal charts (Rusner, Argentina), and then measured with the usual correction (if any) the subjects wore at the time of the exam. If a subject did not reach 10/10 vision, a suggestion was made about him or her to improve the prescription with a visit to his ophthalmologist. After testing visual acuity, all subjects were evaluated with an automatic autorefractometer without cycloplegia (Genesis, Model GEN RK1, China).

Then, subjects participated in a blink test and a game to educate themselves on the need to blink when paying attention to digital devices

or computer screens. For the present analysis, the identity of the subjects was kept confidential according to the precepts of the Declaration of Helsinki. The present study was approved by the Ethics Committee of the Argentinian Council of Ophthalmology.

The data input was done through a cell phone app designed for this purpose. An Excel database was generated by the system. The statistical study consisted of analyzing the prevalence of decreased uncorrected visual acuity less than 8/10, which is a proxy for the diagnosis of myopia or myopic astigmatism in the population[12]. The autorefractor data were converted to the spherical equivalent refractions and presented as relative prevalence.

Refractive astigmatism was reported as that obtained with the autorefractor. Only the data of the right eyes are presented as the spherical equivalent of both eyes was similar (r=0.84). Different cut points in spherical equivalent are presented according to the non-cycloplegic autorefraction.

Results

The present study involved 2299 people with an average age of 24.65 ± 7.87 years, of which 1562 (67.94%) were women. In total 1042 (45.32%) said they wore glasses but only 603 (26.23%) had brought them the day of the exam. Out of the sample, 1613 (70.16%) had 8/10 or more uncorrected vision, that is, only 29.84% may have had clinically significant myopia or astigmatism. Besides, there were 163 subjects (7.1% of the totally autorefracted sample) with refractive astigmatism equal or worse than -2.00 diopters.

As said, 603 subjects were wearing glasses at the time of the examination, and out of them, 450 (19.61% of the total of 2299 subjects) had myopia of -0.50D or worse in the autorefractometry. Of those who said they wore glasses (brought or not), 710 (30.88%) had myopia of at least -0.50D or worse in the autorefractometry, 553 (24.05%) had myopia equal to -1.00D or worse, and 133 (5.79%) had astigmatism of -2.00D or worse. Of those who said they wore glasses but had not brought them (440 subjects) only 19 subjects (0.8%) had visual acuity lower than 5/10 in their better eye.

Regarding sports practice, when the analysis was restricted to myopic patients with astigmatism less than -2.00D, there were 1316 subjects who did not practice any sports, 418 with indoor sports and 352 with outdoor sports. The prevalence of visual acuity below 8/10 was 27.58%, 24.88% and 19.88% for these three groups respectively, the difference between no sport and outdoor sport being significant (chi-square = 10.24, $p = 0.001$).

Discussion

This study reports the prevalence of uncorrected visual acuity in university students from a South American country. Based on the determination of unaided visual acuity, this study suggests that the prevalence of significant myopia may be close to 30% in these students, and considering a spherical equivalent in the autorefractometry worse than -1.00D (for excluding cases of accommodative pseudo myopia), the prevalence of myopia would be in the order of 24%.

It is noted that the myopic population using glasses at the time of the exam was around 20% of the whole sample. Astigmatism equal or worse than -2.00D was also highly prevalent in this sample of Andean subjects (7.1%). Although the prevalence of myopia in this Latin American city was not as high as in European cities or in East Asian urban environments, this Mendoza university student population had similar myopia prevalence as the adult unselected sample of office-workers from Buenos Aires, with 6 years of university study (29%).

A possible drawback of this study is the fact that myopia prevalence was established as suggested by Leone *et al.* with a cut point of 7/10 in uncorrected visual acuity[12], and that the autorefraction, which is the gold standard for myopia and hyperopia detection, was performed without cycloplegia. On the other hand, the figure for refractive astigmatism is probably accurate

because this measurement is not affected by accommodation induced by the autorefractor. Another drawback could be that the selection of subjects was not population based. The campaign about blinking and computer use may have possibly called the attention of unselected students and not only of spectacle users. In this sense, the sample seems population based because the gender distribution was similar to that of the matriculated students in the university (females: 62% matriculated vs. 67% in this sample).

To our knowledge there is no other study in Latin America reporting astigmatism or myopia in a university student population. More studies are needed in this sense. The academic achievement of countries all over the world suggests that more than 50% of the adult population has finished tertiary education in some countries like Canada, Russia, Japan, Israel, Singapore, China, Hong Kong and Korea. While Argentina, Chile and Brazil have between 18-30% subjects with tertiary studies in the adult population[13]. The figures for prevalence of myopia in university students combined with the population rate of people reaching those levels of study could be useful to predict the trends in myopia prevalence worldwide. In Korea, for example, 95% of students reach tertiary level having myopia in a country with 50% population rate of such level of education[14]. The picture looks very different in Argentina where 30% of the population reaches tertiary level with only 25% of students being myopic. The epidemic of myopia seems to show different trends in Asia or Latin America. More studies are needed in this last region to get an accurate worldwide picture. The present cross-sectional finding of lower myopia prevalence in students engaged in outdoor sports is in line with previous research showing that myopia prevalence is lower in children who spend more time outdoors.

Conclusion

The prevalence of myopia was close to 25% in this Latin-American population of university students. Compared to the prevalence in South and South-East Asian university students this prevalence seems very low. More studies are needed about the prevalence in this region to make accurate worldwide predictions about myopia burden.

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