Epidemiologic study of anisometropia in students of Natal, Brazil

Estudo epidemiológico da anisometropia em estudantes da cidade de Natal, Brasil

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ABSTRACT

Purpose: To perform an epidemiologic study in students in Natal/Brazil, with relation to refractional anisometropia, evaluating criteria such as: gender, age, and association with strabismus and amblyopia. **Methods:** A study of 1,024 students randomly selected from several districts of Natal/Brazil was undertaken by the Department of Ophthalmology of the Federal University of Rio Grande do Norte (UFRN), observing the following criteria of ≥ 2 spherical or cylindrical diopter refractional anisometropia relating it to sex, age, association with strabismus, amblyopia and anisometropia classification. **Results:** We found a prevalence of 2% (N=21) anisometropia in the students. The female gender predominated with 81% (N=17). In students with anisometropia, we observed an association with strabismus in 9.5% of cases (N=2), both with exotropia. The association of anisometropia with amblyopia occurred in 47.6% of the cases (N=10), with 8 cases of unilateral amblyopia and 2 cases of bilateral amblyopia. **Conclusions:** There was a predominance of anisometropia in females, and an increased prevalence of strabismus and amblyopia in students with anisometropia.

Keywords: Anisometropia/epidemiology; Amblyopia; Students; Refractive errors; Strabismus

Study Location: Ophthalmology Service, Onofre Lopes University Hospital (HUOL), Department of Surgery - Federal University of Rio Grande do Norte (UFRN) Natal/Brazil.

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INTRODUCTION

Anisometropia is the refractional difference between the eyes[1]. Some authors consider the tolerance limit of anisometropia to be 2 diopters (D), and deem it prudent to avoid prescriptions with differences greater than 3D[1]. Each 1D of difference, corrected with glasses, results in 1% alteration of retinal image size, called aniseikonia, when the anomaly is axial, and from 1.5 to 2.0% when it is refractive. The eye generally tolerates aniseikonia of up to 4%[2].

Anisometropia can be classified into: axial, when it is the result of the difference in length of the anterior-posterior axis of the ocular bulbus; and refractive, when it is the difference in the dioptric mean refraction index between the eyes or in the curvatures of the ocular surfaces. It can also be classified into: simple hypermetropic, one hypermetropic eye and the other emmetropic; compound hypermetropic, both eyes hypermetropic; simple myopic, one eye myopic and the other emmetropic; compound myopic, both eyes myopic; and antimetropic, one eye myopic and the other hypermetropic[1-2].

Anisometropic amblyopia is the reduction of vision resulting from uneven refraction in both eyes[1]. Amblyopia is more frequent in cases of hypermetropia than in those of myopia[1]. It can be bilateral or unilateral, the latter being more severe[1].

The objective of study is to carry out an epidemiologic study in students

in Natal/Brazil, in relation to refractional anisometropia, evaluating criteria such as sex, age, association with strabismus and amblyopia.

METHODS

This is a transversal study, in which the sample was randomly selected. It consisted of individuals between the ages of 5 and 46 years, of an elementary or high school, of the private or public system in Natal, Brazil, in 2001.

Four samples were considered for the methodological scheme, corresponding to the four districts in to which Natal is divided: North, South, East and West.

The student population in 2001 was 196,116, distributed by district and type of institution (public or private).

The methodological procedure for the sample selection was in two stages:

Stage I: Determining the sample size.

Stage II: Random selection of schools and their respective students.

The size of the general sample of 1,024 students was distributed proportionally among the four districts. Thereafter, the number of schools and which of these would be selected from each district, was determined by the Proportional Probability of Size method (PPS), taking into consideration the type and level of each school. Of 341 schools, 79 were selected, from which students per study period and number of students per grade level were selected, the selection being made from the school attendance list, with the help of a random number generating computer program.

The students answered a standard questionnaire, applied by professors and residents in Ophthalmology at UFRN, who provided names, socioeconomic level as well as personal and familial nosologic precedents.

The 1,024 students underwent an ophthalmological examination which included: measuring visual acuity, diagnostic tests for strabismus (Hirschberg, Krinsky and cover test), refraction (retinoscopy with cycloplegia), biomicroscopy, tonometry and fundoscopy.

For purposes of statistical analysis, relative and punctual frequency of the study variables was determined, and data were processed by the SPSS computer program (Statistical Package for Social Science) Data Editor 10.0.

From this sample, patients with anisometropia who presented refractional difference between the eyes greater or equal to 2 spherical or cylindrical diopters were evaluated, and the following criteria were observed: gender, age, association with strabismus and amblyopia, as well as anisometropia classification.

RESULTS

Of the 1,024 examined students, a prevalence of 2% (N=21) anisometropia $\geq$ 2D spherical or cylindrical was encountered.

The female gender predominated with 81% (N=17) in relation to the males with 19% (N=4) anisometropia cases among the students.

Age varied from 7 to 24 years (average=15.2 years and median=16), grouped in the following manner: from 5 to 9 years with 14.3% (N=3); 10 to 14 years with 23.8% (N=5); 15 to 19 years with 52.4% (N=11); 20 to 24 years with 9.5% (N=2).

Of 21 cases of anisometropia, we observed 2 (9.5%) patients with divergent strabismus, the other 19 (90.5%) being orthotropic.

Association of anisometropia with amblyopia occurred in 10 (47.6%) cases, 8 being unilateral amblyopia and 2 bilateral amblyopia.

When we related cases of amblyopic anisometropia (N=10) to previous ophthalmological treatment, only 2 (20%) had been treated. Among patients with anisometropia without amblyopia (N=11), five (45.4%) cases had undergone previous treatment.

The distribution of students in the anisometropia classification was as follows: simple hypermetropic (6 cases) - 28.6%; compound hypermetropic (5 cases) - 23.8%; simple myopic (4 cases) - 19%; compound myopic (5 cases) - 23.8%; antimetropia (1 case) - 4.8% (Table 1).

As to classification of anisometropia with amblyopia (N=10), there was the following distribution: 3 cases (30%) with simple hypermetropia; 2 cases (20%) with compound hypermetropia; 1 case (10%) with simple myopia; 3 cases (30%) with compound myopia; and 1 case (10%) with antimetropia (Table 1).

No biomicroscopic alterations were detected. The retina was normal in 18 cases (85.7%), and in 3 cases there were retinal abnormalities. The principal fundoscopic findings were: white without pressure; peripapillar granuloma clinically suggestive of toxocara; and chorioretinitis scar clinically suggestive of toxoplasmosis in the macular region. By definition, the latter patient was excluded from the amblyopia group.

DISCUSSION

Among the 1,024 students examined in our study, we observed a prevalence of anisometropia in 21 individuals (2%). This differs varies greatly from other studies, since some authors consider anisometropia to be a refractional difference

Table 1. Association of anisometropia types with the presence of amblyopia in 21 studied patients

Anisometropia classification	Presence of amblyopia		Total	
	Yes	No		
	n	n	n	%
Simple hypermetropia	3	3	6	28.6
Compound hypermetropia	2	3	5	23.8
Simple myopia	3	2	5	23.8
Antimetropia	1	-	1	4.8

$\geq$ 2D[3], which was the standard of this study, while other authors consider it to be $\geq$ 1D[4-5]. Some studies detected anisometropia prevalence of 2.97% and 2.8% respectively[6-7]. Other studies encountered a higher prevalence, of 4.7%,and 3.5%, respectively[8,5]. On the other hand, another study observed a lower prevalence, of 1%[9].

In relation to age, a progressive increase of anisometropia up to the 15-19 year age group was observed, with 52.4%, followed by a decline in the rate in the next age group (20 to 24 years) to 9.5%, probably due to the lower number of cases. In the literature there are reports that anisometropia increases with age[10]; however, this was not corroborated in this study.

Among patients with anisometropia, the prevalence of strabismus was 9.5% (2 cases). This result was greater than the prevalence of strabismus in the child population[11-14].

An association of anisemetropia with amblyopia was found in 47.6% of the students (10 cases), similar to that encountered in another study (51.1%)[15].The students with anisometropia and amblyopia had not undergone previous ophthalmological treatment in the majority of cases (77.8%). This statistics reflects the importance of prevention, through ophthalmological examination at preschool age, in order to prevent amblyopia in these patients.

Anisometropic amblyopia is more common in the hypermetropic type, because the child will accommodate sufficiently to focus with the less ametropic eye. Since this accommodation is a binocular phenomenon, the other eye will remain unfocused[2]. In this study, amblyopia by compound or simple hypermetropic anisometropia was observed in the majority of cases (55.6%; N=5).

CONCLUSIONS

We concluded that there was a 2% prevalence of anisometropia in the students of Natal/Brazil, with a predominance in the female gender (81%). There was relative increased prevalence of strabismus and amblyopia with anisometropia, compared to the general population. Ophthalmological examination at preschool age is of utmost importance, in order to be able to identify and treat anisometropia at an early stage, thus preventing amblyopia.

RESUMO

Objetivo: Realizar um estudo epidemiológico em estudantes de Natal/Brasil, com relação à anisometropia refracional, avaliando os seguintes critérios: sexo, idade e associação com estrabismo e ambliopia. **Métodos:** Foram estudados 1.024 estudantes, randomicamente selecionados, pertencentes aos diversos distritos da cidade de Natal/Brasil, pelo Departamento de Oftalmologia, da Universidade Federal do Rio Grande do Norte (UFRN), observando os seguintes aspectos, quanto à anisometropia $\geq$ 2 dioptrias esférica ou cilíndrica, sexo, idade, associação com estrabismo e ambliopia, e os tipos de anisometropia. **Resultados:** Encontrou-se prevalência de anisometropia de 2% (N=21) nos estudantes. O sexo feminino predominou com 81% (N=17). Nos estudantes com anisometropia, observou-se associação com estrabismo em 9,5% (N=2), ambos com exotropia. A associação de anisometropia com ambliopia ocorreu em 47,6% (N=10), sendo 8 casos com ambliopia unilateral e 2 casos com ambliopia bilateral. **Conclusão:** Houve predominância de anisometropia no sexo feminino; e aumento da prevalência de estrabismo e de ambliopia em estudantes com anisometropia.

Descritores: Anisometropia/epidemiologia; Ambliopia; Estudantes, Erros de refração; Estrabismo

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