The Epidemiology of Ophthalmological Disease among School Age Children in Rural India

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Résumé :

(traduction)

La cécité est l'une des premières préoccupations de santé publique en Inde rurale. Pourtant on sait très peu de choses au sujet de la prévalence des maladies oculaires chez les enfants d'âge scolaire en Inde. La base de données cliniques de l'institut d'ophtalmologie de Srikiran, qui décrit les visites des cliniciens dans les écoles de Kakinada , a été analysée rétrospectivement, pour déterminer la prévalence des maladies oculaires chez 8488 étudiants âgés de 18 ans et moins. Parmi les maladies diagnostiquées, on trouve l'impact réfractaire de base (comprenant plusieurs niveaux d'astigmatisme) comme étant la maladie la plus fréquente, suivie par le strabisme. Chez aucun des sujets testés, la carence en vitamine A n'est un facteur ayant contribué aux maladies oculaires.

Mots-clés : Épidémiologie, ophtalmologie, cécité, enfants, santé internationale, Inde

Abstract:

Preventable blindness is one of the primary health concerns in rural India, yet little is known about the prevalence of eye disease among India's school-aged children. The clinical database of the Srikiran Institute of Ophthalmology, which describes clinicians' visits to schools in Kakinada, India, was analyzed retrospectively to determine the prevalence of eye disease among 8488 students aged 18 years and younger. Among diagnosed illnesses, basic refractory impingement (including degrees of astigmatism) was the most common, followed by squinting. Vitamin A deficiency was not a factor in any of the tested subjects.

Keywords: Epidemiology, Ophthalmology, Blindness, Children, International health, India

Introduction

The southern Indian state of Andhra Pradesh has an official population of 76.2 million, representing 7% of all Indians who experience slightly lower total and female literacy rates than the national average (Ministry of Health and Family Welfare, 2011). Further, Andhra Pradesh is home to 7% of India's "scheduled" or low caste people (Ministry of Health and Family Welfare, 2011). A study of vision deficit in this area was performed by the LV Prasad Eye Institute in 2001 (Dandona & Dandona, 2001), as part of the World Health Organization's (WHO) VISION 2020 international initiative to contextualize visual impairment as an international public health issue. The WHO estimated that there were 18.7 million blind people in India in 2001, a number projected to grow to 24.1 million by 2010. This is an underestimate in comparison with other studies that suggest that almost 4 million Indians go blind every year as a result of cataracts alone (Singh, Garner, & Floyd, 2000). The comparative depth and rigor of the former study however, suggests that the WHO's VISION 2020 estimate is the most accurate.

Regardless of the disparity in estimates, it is clear that impaired vision is a serious issue in this region. Comprehension and action on this issue are impeded by a general lack of information on the distribution and epidemiology of eye disease in rural India. This is especially true for children, who are rarely the subjects of ophthalmological study. Causes of visual impairment include injury, nutritional deficit, lack of protection against UV rays, and strain due to fine acuity needs. Currently, the extent to which eye disease manifests earlier in life is unknown due to the paucity of investigation in this population.

In the present study, we used a clinical database from an ophthalmological hospital in Kakinada, India, to identify major diagnosable issues experienced by Indian school-aged children. Our intent was to estimate the extent of ophthalmic disease burden in this specific population and to describe and quantify the relationships between disease presentation and demographic characteristics.

Methods

Clinical and administrative data from the Srikiran Institute of Ophthalmology in Kakinada, India, were obtained for the period from 2003 to 2010. This data describes visits by clinic staff to local public schools, where students (aged 18 years and younger) were screened for basic, diagnosable eye disease. The data also describes the students' treatment regimens and outcomes and refers to a single school visit per child.

Descriptive statistics were employed to determine disease prevalence. Bivariate statistical analyses (chi square and independent samples t-tests) were used to explore relationships between clinical and demographic measures. These tests were deemed appropriate due to the normal distributions (of continuous variables) and large cell sizes (for discrete variables), as well as the dichotomous nature of the outcome diagnosis variable, which was coded as either disease presence or absence.

Permission for this study was granted by the Research Ethics office of the University of Ottawa.

Results

Within the dataset, there were a total of 8488 students 18 years old and younger, of whom 4299 (50.6%) were male and 4189 (49.4%) female. The age of the students was normally distributed (confirmed through examination of measurements of central tendency), with 729 (8.6%) aged from 0 – 6 years, 4920 (58%) aged 7 – 12 years, and the remaining 2839 (33.4%) aged 13 – 18 years.

Upon examination, 4774 (56.2%) students were found to have no diagnosed eye disease. Among the 43.8% with a positive diagnosis, the most common issues were refraction errors (2927; 34.5%), squinting (239; 2.8%), and swelling (108; 1.3%). There were 128 (1.5%) subjects who received multiple diagnoses.

Gender was shown to have a statistically significant association ($p<0.05$) with the development of multiple diagnoses, including: strabismus, redness, itching, microcornea, watering eyes, and an injury obtained to the eye. Among males, there was an increased association of redness ($p<0.001$), itchiness ($p=0.014$), watering ($p=0.031$), and eye injury ($p=0.014$). Females had a higher likelihood of developing strabismus ($p=0.001$) and microcornea ($p=0.042$). The full list of gender associations is presented in Table 1.

There was a relationship between the age of students and the diagnosis of strabismus, blepharitis, coloboma, corneal opacity, ptosis, swelling, microcornea, refraction errors,

watering, and cataract development. The average age of diagnosis was younger for students with strabismus (p<0.001), blepharitis (p=0.010), coloboma (p<0.001), corneal opacity (p=0.038), ptosis (p=0.001), swelling (p=0.026), microcornea (p=0.030), watering (p=0.016), and cataract development (p=0.003). The only diagnosis that was more likely among older students was refraction errors (p<0.001). Associations between diagnoses and age are summarized in Table 2.

Unsurprisingly, student grade was associated with most of the same diseases that were found to be associated with age, as both age and grade are highly correlated in this dataset. None of the examined subjects showed signs of Vitamin A deficiency.

Discussion

In rural India, preventable blindness is prevalent at epidemic levels (Singh et al., 2000). The most comprehensive study to date of the Indian population, conducted in 2001, sampled fewer than 12,000 subjects and did not examine children under 15 (Dandona & Dandona, 2001). Nevertheless, they found that the most common causes of impaired vision were retinal diseases (35.2%), amblyopia (25.7%), optic atrophy (14.3%), glaucoma (11.4%), and corneal diseases (8.6%). Not surprisingly, prevalence of reduced vision increased with advancing age and with decreased socioeconomic status (Dandona & Dandona, 2001).

In addition, Dandona and Dandona (2001) found that while cataracts were the leading cause of blindness in the general population, the odds of this statistical association was 96% higher for women than men and (the same association was 72% higher in rural areas). For all causes, women were 37% more likely than men to be blind. It should be noted that the data set used by Dandona and Dandona was largely comprised of adults. In our sample, while gender differences were present, there was nothing resembling this profoundly disproportionate representation described in the 2001 study. While cataract development was relatively rare amongst children in our study, there was no significant difference in prevalence between males and females.

Furthermore, refraction errors (astigmatism) were the most common diagnoses, followed by various degrees of squinting and then swelling. This result aligns with other global studies of pediatric ophthalmology, including a

Table 1 Association between Gender and Ophthalmological Diagnosis.

Disease	*P-value (chi-square)*
Strabismus	0.001
Bitot's Spots	0.275
Redness	<0.001
Blepharitis	0.355
Coloboma	0.113
Corneal opacity	0.975
Ptosis (drooping)	0.744
Itching	0.014
Swelling	0.405
Microcornea	0.047
Refraction error	0.304
Squinting	0.994
Watering	0.031
Injury	0.014
Nystagmus	0.318
Cataract	0.964

Table 2 Association between Age and Ophthalmological Diagnosis.

Disease	*P-value (chi-square)*
Strabismus	<0.001
Bitot's Spots	0.238
Redness	00972
Blepharitis	0.010
Coloboma	<0.001
Corneal opacity	0.038
Ptosis (drooping)	0.001
Itching	0.104
Swelling	0.026
Microcornea	0.030
Refraction error	<0.001
Squinting	0.601
Watering	0.016
Injury	0.526
Nystagmus	0.774
Cataract	0.003

Swedish study in which astigmatism and strabismus were the most commonly described results after screening (Kvarnström, Jakobsson, & Lennerstrand, 2001). Strabismus was also commonly found in a study pertaining to children adopted from Eastern Europe (Grönlund et al., 2010). For our sample, strabismus was generalized to incorporate various related diagnoses, including alternating exotropia, alternating esotropia, hypotropia, hypertropia, and amblyopia.

Studies examining eye disease among rural Indian school-age children are rare, despite some consensus that global rates of ophthalmological issues among children are rising (Gwiazda, Grice, Held, McLellan, & Thorn, 2000). Diagnosis is a necessary step before treatment. Thus, an inability to detect eye disease at an early age (many of which are likely preventable or curable) hobbles treatment efforts. In reference to the current study, the diagnosis of astigmatism can be corrected with appropriate corrective lenses if the resources are available to the population and a diagnosis can be made. In total, 43.8% of the Srikiran pediatric population was diagnosed with eye disease, which is a concerning number. Beyond age and gender, our study offers no insight into additional factors that may predict the development of eye disease, such as caste, socioeconomic status, nutritional profile, sun exposure, or specific activities pursued. We have demonstrated a high burden of disease among this youth population, which must be the foundation of future investigation into predictive factors and the effectiveness of treatment regimens.

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