



The epidemiology of ophthalmological disease among school age children in rural India

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Abstract

Preventable blindness is one of the primary health concerns in rural India. Causes of visual impairment include injury, nutritional deficit, lack of protection against UV rays, and strain due to fine acuity needs. The extent to which eye disease manifests earlier in life is yet unknown, as epidemiological ophthalmological investigations in this population are rare. Using a clinical database from the Srikan Institute of Ophthalmology in Kakinada, India, major diagnosable issues experienced by Indian school-age children were identified and their prevalence estimated. Descriptive statistical analysis was performed on the data for patients under 18 years of age identified through school visits. Basic refractory impingement, including degrees of astigmatism, was most prevalent, followed by squinting. Vitamin A deficiency was not a factor in any of the tested subjects. The gender, age and relative grade of the students were associated with the onset of specific issues. Subclinical disease, possibly indicative of metabolic or physiological issues, was not measured in this study. The most common ophthalmological presentations can be easily addressed through the provision of accommodating eyewear. Through further research, more preventative and treatment options can be made available for rural Indian students.

La cécité évitable est l'un des plus gros problèmes dans l'Inde rurale. Les causes des déficiences visuelles comprennent les blessures, le déficit nutritionnel, un manque de protection contre les rayons ultraviolets et la fatigue à cause des besoins visuels. La fréquence des maladies des yeux qui se développe tôt dans la vie est encore inconnue, car les études épidémiologiques en ophtalmologie dans cette population sont rares. En utilisant une base de données clinique du Srikan Institute of Ophthalmology à Kakinada en Inde, la prévalence des problèmes principaux des enfants indiens d'âge scolaire ont été identifiés et estimée. Une analyse statistique descriptive a été réalisée sur les données des patients sous l'âge de 18 ans qui ont été identifiés grâce à des visites scolaires. Les erreurs réfractives, incluant l'astigmatisme, étaient les plus prévalentes, suivies par le plissement des yeux. Une carence de vitamine A n'était pas un facteur dans les résultats tester. Le sexe, l'âge et les grades des étudiants ont été associés avec l'apparition des problèmes spécifiques. Les maladies cachées qui sont indicatives de problèmes métaboliques ou physiologiques ne seront pas détectées dans cette étude. Les problèmes ophtalmologiques les plus communs peuvent être facilement traités par la fourniture des lunettes. Avec plus de recherche, les étudiants auront accès à des options plus variées de prévention et de traitement.



Institute background

India is home to approximately 1 billion of the world's 6 billion inhabitants (1). However, of these 1 billion people almost 60% live in destitution well below the poverty line, and live in rural villages throughout the country (1). Prevalent in these rural villages is ophthalmological disease. With a lack of resources to accommodate affected individuals, treatment is not being provided. However, the efforts of one man's mission to make a difference has changed the lives of over 1 million people in India. Dr. Sankurathri, an Indian native and Ottawa resident up until 1988, is responsible for this. After a tragic plane accident claimed the lives of his wife and 2 young children in 1985, Dr. Sankurathri was left contemplating what to do next (2). After selling his Ottawa home and quitting his job, he returned to India and created a foundation in memory of his beloved wife (2). He also built a school and an eye hospital (2). From here, the Srikan Institute of Ophthalmology was created and is now the forefront in medical technology and treatment for eye issues in the Indian state of Andhra Pradesh.

Methods

The data within the Srikan dataset were gathered from various eye clinics set up throughout a rural area of India close to Kakinada, where the institute is located. In this study, descriptive statistical analysis was completed for the 8488 students 18 years old and younger in Srikan's clinical database. Bivariate statistical analyses were used to explore relationships between clinical and demographic measures: chi-Square and independent samples t-tests were employed to test the association between gender, age, and grade with each of 16 outcomes.

Results

Within the dataset, there were a total of 8488 students 18 years old and younger, of whom 4299 (50.6%) were males and 4189 (49.4%) females. The age distribution of the students was normal, 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.

After examination, 4774 (56.2%) students received no diagnosis of an ophthalmological issue, while the most common diagnoses were refraction errors (2927; 34.5%), squinting (239; 2.8%) and swelling (108; 1.3%). There were 128 (1.5%) of children who received multiple diagnoses within their visit.

Gender was shown to have a statistically significant association ($p < 0.05$) with the following:

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

The average age of students was associated significantly with the following:

Associations between Diagnosis and Age		
Diagnosis	P-value (t-test)	Association
Strabismus	<0.001	Younger
Bitot's Spots	0.238	-
Redness	0.972	-
Blepharitis	0.010	Younger
Coloboma	<0.001	Younger
Corneal opacity	0.038	Younger
Ptosis (drooping)	0.001	Younger
Itching	0.104	-
Swelling	0.026	Younger
Microcornea	0.030	Younger
Refraction error	<0.001	Older
Squinting	0.601	-
Watering	0.016	Younger
Injury	0.526	-
Nystagmus	0.774	-
Cataract	0.003	Younger

The average grade of students was associated significantly with the following:

Associations between Diagnosis and Grade		
Diagnosis	P-value (t-test)	Association
Strabismus	<0.001	Lower grade
Bitot's Spots	0.816	-
Redness	0.695	-
Blepharitis	0.006	Lower grade
Coloboma	<0.001	Lower grade
Corneal opacity	0.023	Lower grade
Ptosis (drooping)	<0.001	Lower grade
Itching	0.044	Lower grade
Swelling	0.023	Lower grade
Microcornea	0.008	Lower grade
Refraction error	<0.001	Higher grade
Squinting	0.622	-
Watering	0.070	-
Injury	0.574	-
Nystagmus	0.707	-
Cataract	<0.001	Lower grade

Discussion

In the rural Indian children population, ophthalmological issues are very common and debilitating. Refraction errors (astigmatism) were determined to be the most common ophthalmological disease followed by various degrees of squinting and then swelling. This seemed to be a common occurrence in other studies including a Swedish study of children's ophthalmological evaluation where astigmatism (refraction errors) and strabismus were the most common results after screening (3). Strabismus was also found commonly in a study pertaining to children adopted from Eastern Europe and in our study Strabismus was seen in 96 (1.1%) of the children examined (4). Strabismus included various diagnoses within this study including alternating exotropia, alternating esotropia, hypotropia, hypertropia and amblyopia.

In total, 43.8% of the population in this study was diagnosed with ophthalmological disease, which indicated poor management and treatment options in this country. This number indicates that with so many children experiencing eye disease, there could be a large population of adults in the future incapable of sight. This population could be nearly impossible to employ and this will lead to greater levels of poverty in the country. A study from the Canadian Journal of Ophthalmology also coincided with our findings that astigmatism was the most common issues within the school age children population of India and that the provision of accommodating eyewear could address most of these issues (5).

Further research on the current availability of treatment and the accessibility of these treatments will allow us to understand why the majority of this population goes untreated and allow us to develop more integrated and effective strategies in providing treatment and help to this desperate population.

A weakness with this study is the database that was used. The information presented was originally intended to be used for solely clinical activity and was not optimized for statistical analysis. The data was undocumented and so errors in initial input and coding may exist.

Conclusion

The prevalence of ophthalmological issues among school-aged children in rural India was quite high (43.8%), suggesting poor treatment and management of these diseases by the current health care system. With so many ophthalmological diseases present in the children, if no treatment is provided then this population will grow up with a serious impairment and will be left without vision. The most common issues were not surprising, as multiple research studies involving children and sight impairments have had similar results. Studies from children in both the Western and Eastern parts of the world have noticed the increased prevalence of astigmatism in the child population in contrast to adults (6). Sight is a crucial part of our everyday lives and it is important to address these issues in countries where health treatment is insufficient. It was determined that 80% of all learning during a child's first 12 years of life is visual (7). With this lack of vision, children in India may experience barriers in learning and this could result in high drop out rates and less population able to work in the future.

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