Section: Miscellaneous

Original Research Article

BURDEN OF OCULAR MORBIDITY AND REFRACTIVE ERRORS AMONG SCHOOL CHILDREN IN AN URBAN FOOTHILL REGION OF NORTHERN INDIA

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ABSTRACT

Background: Childhood ocular morbidity is a serious social health issue, uncorrected visual impairments may have negative academic results and quality of life. School-based screening offers a good platform of early detection and management. To determine the estimates on the prevalence and tendency of ocular morbidity among school going children aged 6-16 years in an urban foothill town within the Garhwal region.

Materials and Methods: Techniques: The study involved community based cross-sectional research that was used to identify 2,003 school children in the government and the privacies school through stratified random sampling. At school, visual acuity, torchlight testing, ocular alignment tests and fundal examination were done. Suspects with suspected abnormalities in the eyes were referred to further assessment. Data analysis was done using relevant statistical measures.

Results: Morbidity in the eye was observed in 37.6 percent of children. The most frequent eye condition was refractive error, and conjunctivitis was the next problem, as well as convergence insufficiency. The children between 11-16 years of age were linked to ocular morbidity which was significantly higher than that of its younger counterparts ($p < 0.05$). There was no considerable correlation with gender. There was a low use of spectacle despite the high rate of refractive errors.

Conclusion: A significant percentage of school-going children have avoidable or curable eye diseases. To mitigate childhood impaired vision, there is a need to have regular eye screening in school and better spectacle adherence.

Keywords: Ocular morbidity; School children; Refractive error; Vision screening; Childhood visual impairment.

INTRODUCTION

Vision is the main aspect of the human development, learning, and social interactions. Of all the senses, the sense of sight is the main channel over which humans see and process the information around them.[1] Although this is critical, the health of the eye, more so as a child, is overlooked until it is too late. Any disturbance in the vision at the formative years might hugely impact on the academic performance, psychological growth and the quality of life in general. Hence, there is the need to detect and establish control over precocious ocular conditions in children as quickly as possible.

In the world, visual impairment is one of the major health issues of concern to people. Introducing the preference, the exact number of individuals who do live with a vision deficiency is approximated to be close to 1.3 billion, with about 80 percent of these instances being preventable or curable. The most common causes in the world are uncorrected refractive errors and cataract, which causes millions

with mild to sever variations being affected, while a significant proportion also experience near vision impairment.[2,3] Childhood blindness alone has a huge burden of disability burden in terms of nearly 70 million blind-person years.[4]

The children of school age are one especially vulnerable group because visual problems will remain undetected because of lack of awareness and presence of screening routine. The most frequent cause of visual impairment in school children and the second most frequent cause of curative blindness is refractive error.[5] Uncorrected vision may adversely affect reading ability, classroom performance, and educational outcome. In most cases, children go on unknowingly adjusting to a low vision by moving closer to the blackboard or bringing books close to their eyes, thus making it hard to detect and treat early.[6]

Childhood ocular morbidity is an issue that is becoming worrisome in India. Population based data among the general population across the nation are scarce; however, the number of blind children per 100,000 is thought to be highest in India, estimated to be 0.80, with significant differences in the rates that are regarded as rural and urban.[7,8] There is evidence that children lose their sight earlier in their lives than other countries in the world with almost a third of the blind children, especially in the rural rural region being affected by circumstances of healthcare access, awareness, and societal economic conditions. Childhood blindness bears a heavy burden especially in developing geographically challenging areas like hilly areas as well as the foothills. The presence of limited healthcare infrastructure, rugged terrain, traditional beliefs, poor nutrition, and ignorance are other factors that have increased the problem. The school-based screening is considered one of the most effective methods of early childhood visual impairment detection and intervention as a big part of childhood visual impairment is preventable.[8,9]

Children between 6-16 years of age form a significant proportion of the population and with the ease of access via schools, they would serve as a good target population of community based eye health programs.[10] However, the information on ocular morbidity of school children in the foothill towns of Garhwal region is lacking. The research was hence done to determine the prevalence of ocular diseases among school children in an urban foothill town of Garhwal in a bid of coming up with region specific data as well as creating awareness on the issue of eye health amongst students, teachers and parents.

MATERIALS AND METHODS

Design and Setting of the study: This was a community-based cross-sectional study, which was carried out in an urban foothill town of Garhwal region named Rishikesh in Uttarakhand, India. Rishikesh is a town in the foothills of the Himalayas and is an embodiment of a blend of urban population with a lack of accessible advanced eye care facilities.

Study Population and Sampling: The study population was school-going kids and the sample included the children between the ages of 6-16 years of age of both genders (girls and boys) in government and private schools of co-education. Stratified random sampling was applied to the selection of seven schools so that they would be represented proportionately. The students who were available during the examination day and had the willingness to be involved in the study were incorporated into the study whereas those who were absent and others who did not wish to be involved were not included in the study. The lowest sample was determined as n = t2PQ/d2 were the variables where the prevalence was 20 ocular morbidity, confidence level was 95, and absolute precision was 2%. The minimum sample size that was computed was 1536 children but 2003 students were interviewed in order to enhance the accuracy of the study.

Data Collection and Ophthalmic Examination: The data on the socio-demographic variables, including age, sex, birth order, number of siblings, and parental occupation was obtained by communicating with the students and teachers. Short history with eyes such as visual complaints and prior eye problems also described.

The ophthalmical examination was performed in a room with sufficient light in the school setting with the help of an optometrist. The Snellen chart was used at a distance of six meters of visual acuity. Torchlight examination entailed examination of eyelids, conjunctiva, cornea, pupil, and lens. Ocular alignment assessment was measured with the help of Hirschberg test and cover-uncover test and extraocular movement assessment. An examination of the fundus was conducted with a non-dilated pupil with the help of a direct ophthalmoscope. (Case referrals- Children with suspicions of refractive errors, strabismus, amblyopia, ocular infections, and others) made Ophthalmology Outpatient Department of AIIMS Rishikesh.

Ethical Considerations and Statistical Analysis: Ethical approval was obtained from the Institutional Ethics Committee of AIIMS, Rishikesh. Permission was taken from school authorities, and informed consent was obtained from parents or guardians. Data were entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics were used to summarize data, while chi-square test and independent t-test were applied to assess associations between variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 2,003 school children aged 6–16 years were examined during the study period. Of these, 1,038 (51.8%) were males and 965 (48.2%) were females. Ocular morbidity was detected in 754 children,

giving an overall prevalence of 37.6%, while 62.4% of the children had no detectable ocular abnormality. Figure 1 illustrates the proportion of children with and without ocular morbidity.

Age-wise Distribution of Ocular Morbidity: The prevalence of ocular morbidity increased with age. Children aged 11–16 years showed a significantly higher prevalence compared to those aged 6–10 years. This increasing trend is depicted in Figure 2.

Pattern of Ocular Morbidities: Among children diagnosed with ocular morbidity, refractive error was the most common condition, followed by convergence insufficiency and allergic conjunctivitis. The relative contribution of major ocular morbidities is shown in Figure 3.

Visual Complaints and Spectacle Usage: Only 5.2% of children were using spectacles at the time of screening, despite a substantially higher proportion being diagnosed with refractive errors. Diminution of vision was the most commonly reported visual complaint.

Multivariate Analysis of Factors Associated with Ocular Morbidity: To identify independent predictors of ocular morbidity, a **multivariate logistic regression analysis** was performed. Variables that were statistically significant in univariate analysis were entered into the model.

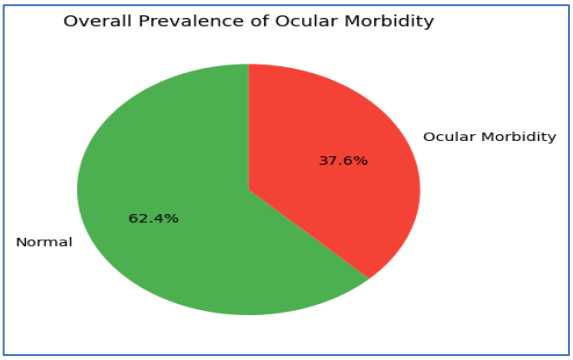

Figure 1: Overall prevalence of ocular morbidity among school children

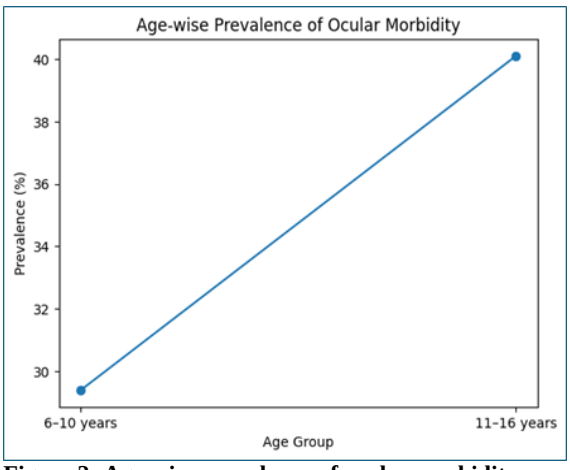

Figure 2: Age-wise prevalence of ocular morbidity

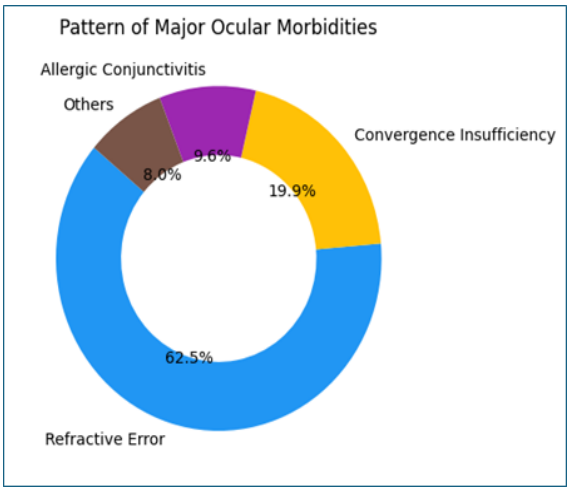

Figure 3: Distribution of major ocular morbidities

Table 1: Age and Gender Distribution of Study Participants (n = 2003)

Variable	Number (%)
Gender	
Male	1038 (51.8)
Female	965 (48.2)
Age Group (years)	
6–10	453 (22.6)
11–16	1550 (77.4)

Table 2: Association of Ocular Morbidity with Age and Gender

Variable	Ocular Morbidity Present n (%)	p-value
Gender		
Male	382 (36.8)	0.420
Female	372 (38.5)	
Age Group (years)		
6–10	133 (29.4)	**<0.005**
11–16	621 (40.1)	

Table 3: Distribution of Specific Ocular Morbidities (n = 754)

Ocular Condition	Number (%)
Refractive error	471 (23.5)
Convergence insufficiency	151 (7.5)
Allergic conjunctivitis	73 (3.6)
Squint	21 (1.0)
Amblyopia	12 (0.6)
Infectious conjunctivitis	12 (0.6)
Others*	14 (0.7)

Includes chalazion, ptosis, vitamin A deficiency, pterygium, and blepharitis.

Table 4: Visual Complaints and Spectacle Use among Participants

Parameter	Number (%)
Spectacle users	105 (5.2)
Complaints of diminished vision	197 (9.8)
Diagnosed refractive error	471 (23.5)

Table 5: Multivariate Logistic Regression Analysis for Factors Associated with Ocular Morbidity

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age group 11–16 years	1.61	1.29 – 2.01	<0.001
Male gender	0.92	0.77 – 1.11	0.420
Non-use of spectacles	2.45	1.85 – 3.24	<0.001
Presence of visual complaints	3.12	2.34 – 4.16	<0.001

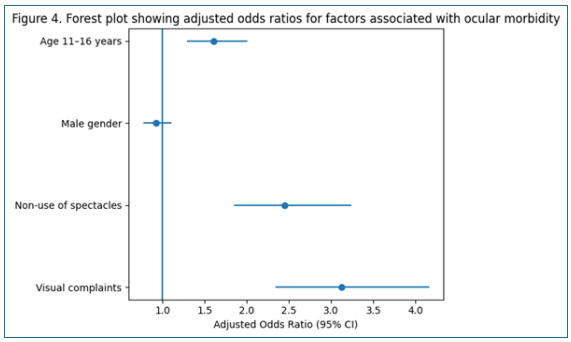

Figure 4: Forest plot showing adjusted odds ratios for factors associated with ocular morbidity

High-resolution forest plot depicting adjusted odds ratios with 95% confidence intervals; the vertical reference line represents OR = 1. Variables crossing the reference line indicate non-significant association.

DISCUSSION

The current research examined the occurrence and trend of ocular morbidity in school-going children aged 6-16 years in an urban foothill town of Garhwal region and established the overall ocular morbidity prevalence to be 37.6 where refractive error was the most prevalent. These results indicate that sight disabilities are a considerable problem among school-going children and the need to have regular school-based vision screening programs.

Picha et al. noted a similar trend by reporting high levels of ocular morbidities in children in school-going age with most of them attributed to refractive errors. Even though the entire prevalence as reported by Picha et al. was relatively lower compared to what was recorded in the current study, both studies showed that there was a significant relationship between an advanced age and ocular morbidity.[10] This could be as a result of differences in geographical terrain, access to healthcare facilities and other lifestyle factors like increase in the number of near-work activities.

The study by Prakash et al. in a large population-based study revealed that the major cause of visual impairment in school children was refractive errors, with a general tendency of higher prevalence in aged age groups.[11] This observation is similar to the current study in the sense that the children within the 11-16 years age group demonstrated high ocular morbidity. The authors explained this trend by the academic pressure and long-term exposure to the screen, which also becomes more and more topical in the investigation population.

Results of a study of Dubey et al. who compared urban and rural school children in India showed a refractive error as the leading ocular morbidity and allergic conjunctivitis and squint as the dominant patterns of ocular disease.[12] Although the prevalence in the article by Dubey et al. was lower than in the current study, the trends of ocular morbidity were mostly similar. The comparatively bigger prevalence in our urban foothill environment could be due to the environment conditions like dust exposure, urbanization and less outdoor physical activity.

Surveys of other surrounding nations have depicted similar trends. In a school-based eye program study in Nepal, Shrestha et al. had found refractive error as the most prevalent ocular pathology among school children, and thus, the pattern of this disease is again similar to the current study supporting the notion that the prevalence of refractive error is consistent with regard to school children in the region.[13,14]

These findings are also supported by evidence found in African settings. Long et al. in an epidemiological study of children in rural Kenya have reported a high prevalence of ocular morbidity in children and refractive errors, as well as treatable childhood conditions, contributing to the majority.[15] Though the prevalence was somewhat different in relation to our results, probably because of socioeconomic and health-system disparities, both studies tend to

conclude that ocular morbidity in children is largely avoidable and that most conditions can be prevented or treated by early intervention.

Yasir et al., who examined Indian school children living in Riyadh, Saudi Arabia, found that refractive errors and ocular morbidities were high, which they attributed to lifestyle change and more time in front of the screen and less time outside.[16] These reasons also can be a factor to some extent in explaining the increased prevalence in the current study particularly those among the older children.

According to evidence provided in the world today, the burden of refractive errors is on the rise particularly within the post-COVID era. The relatively high level of ocular morbidity found in our study is put into important contextual frames by a global investigation published in the British Journal of Ophthalmology, which found that there is a significant increase in childhood myopia after sustained lockdowns and upsurges in the use of digital tools.[17]

On the whole, the current research is consistent with recent national and international literature reports on the identification of refractive error as the most important cause of ocular morbidity in school children. The greater rate of occurrence highlights the necessity of enhancing school-based vision screening initiatives, observation of better adherence to spectacles, and raising awareness among parents and educators, especially with geographically distinctive areas like the foothills of the Himalayas.

Limitations and Future Recommendations: The current study has got some limitations. As a cross-sectional research, it is a school-based study, such that causal relationships between them could not be determined. Cycloplegic refraction and other diagnostic studies were not carried out in details at the school level and thus can have underestimated, some ocular ailments. There was also failure to measure such factors as screen time, outdoor activity, and socioeconomic status. They ought to conduct future research designs that employ longitudinal designs, behavioral and environmental risk factors, as well as effectiveness of school-based vision screening and spectacle compliance programs.

CONCLUSION

The paper indicates that ocular morbidity in school-going children in one of the foothill towns of the Garhwal region is high with most of the children having refractive error. The morbidity associated with the eyes was as well more significant in older children putting emphasis on the necessity of early detection and intervention. This population can have a significant number of cases of avoidable visual impairment reduced through strengthening of school eye screening and enhancing the level of awareness among the parents and teachers.

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