

Prevalence of Refractive Errors among Primary School Children in the Southern Region of Bangladesh

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Abstract

Refractive errors are considered as avoidable conditions which may lead to visual disabilities in children. A cross-sectional study was conducted between January and May of 2021 in a tertiary level specialized eye hospital in the southern region of Bangladesh to assess the refractive errors among primary (elementary) school children. Our study population was all the primary school children attending the outpatient department of the hospital. However, we used convenient sampling in the study. A total of 252 primary school-going children were examined – 148(58.7%) boys and 104(41.3%) girls. Among them, the minimum age was seven years, and the maximum age was 12 years. The mean age of the children was 9.67 years. Among the refractive errors, myopia was the highest prevalent condition (103 children, 50%), followed by astigmatism (77 children, 37.4%), and hyperopia (26 children, 12.6%). Among astigmatism, myopic astigmatism was 58(75.3%), while mixed astigmatism was observed in 13(17%) children and hyperopic astigmatism was found in 6(7.8%) children. The amblyopia was noted in 17 children (6.7%). The visual acuity was improved after corrections of the refractive errors.

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Introduction

Refractive error is the most common cause of visual impairment and the second most common cause of blindness in the world.¹ The World Health Organization (WHO) reported that about 153 million people above five years of age are visually impaired due to uncorrected refractive errors.² Around 12.8 million children between 5 and 15 years of age are visually impaired, with a global prevalence of 1% due to uncorrected or inadequately corrected refractive errors.¹ Visual impairment due to uncorrected refractive errors can lead to short-term and long-term consequences in adults and children.¹⁻³ Moreover, the uncorrected refractive error could decrease a child's interaction and learning negatively affecting his or her learning process in the classroom.⁴ Refractive errors are considered avoidable conditions which may lead to visual disabilities in children.¹ The price option of

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spectacles should be a cost-effective health intervention. Therefore, the Vision 2020 initiative to eliminate avoidable blindness has given high priority to the correction of refractive error and has placed it within the category of childhood blindness.⁵ Early detection and timely management can help to prevent refractive error-related visual impairment/disability as well as further blindness. Hence, we proposed this study to assess the prevalence of refractive errors among the primary school children attending the outpatient department of the hospital.

Methods

This cross-sectional study was carried out in Sheikh Fazilatunnesa Mujib Eye Hospital and Training Institute (SFMEHTI), Gopalganj, Bangladesh, between January and May of 2021. This study included all the primary school-going children who are attending the outpatient department of this hospital. We excluded all the patients who needed emergency management and the other causes of visual loss, corneal ulcer, phthisis bulbi, ocular tumour and non-cooperative patients. Variables include age, gender, visual status, refractive errors, and amblyopia. Informed written consent was taken from the guardian of the patient. Ethical clearance was obtained from the institutional ethics committee in accordance with the declaration of Helsinki. An eye team consisting of outdoor medical officer under the guidance of consultant ophthalmologists examined the study participants. The guardians were sensitized about the magnitude of childhood blindness, their role in the early detection of vision problems, and other eye diseases. We examined each eye separately using the Snellen chart and record all data in data collection form including age, sex, class (grade), visual acuity and diagnosis. Refractive errors

were diagnosed when the presenting visual acuity was less than 20/40 and improved to >20/40 with correction. Myopia was defined as measured objective refraction of $\geq -0.5D$ spherical equivalent in one or both eyes. Hyperopia was considered when the measured objective refraction of $\geq +2.0D$ spherical equivalent in one or both eyes was present. Astigmatism was considered when the measured objective refraction of $\geq 0.75 D$ cylinder was there in one or both eyes. These refractive errors were categorized according to the Refractive Error Study in Children (RESC) Survey group.⁶

Results

A total of 252 primary school children aged between 7 and 12 years participated in this study. Among them, 148(58.7%) were boys, and 104(41.3%) were girls. About 44.4% of children were occupied in the group of 11 to 12 years of age. Among the age boys, 27% of children were in the 7 to 8 years of age, 29.7% were in the 9 to 10 years of age, and 43.2% were in the 11 to 12 years of age group. Among the girls, the frequency of age groups was 21.2%, 32.7%, and 46.2% in the 7 to 8 years, 9 to 10 years and 11 to 12 years of age-group respectively. The mean age was 9.67 ± 2.34 years (Table-I). The uncorrected visual acuity was 6/12 or less in 131(51.9%) and in 127(50.3%) of right eye and left eye respectively. After refraction, the rate was reduced to 8.7% (right eye) and 7.9% (left eye). Among the study subjects, 46(18.3%) was presented with emmetropia and rest of the children (206 children, 81.7%) were associated with ametropia (refractive errors). Among the refractive error, myopia was the highest occurrence (103 children, 50%) followed by astigmatism (77 children, 37.4%), and hyperopia

(26 children, 12.6%). Among astigmatism, myopic astigmatism was 58(75.3%). Mixed astigmatism was found in 13(17%) children and Hyperopic stigmatism found in 6(7.8%) children. The amblyopia was noted in 17 children (6.7%) (Table-II).

Table-I: Distribution of age and gender of the study subjects (n=252)

Age group	Boys Number (percentage)	Girls Number (percentage)	Total Number (percentage)
7-8 years	40 (64.5)	22 (35.5)	62 (24.6)
9-10 years	44 (56.5)	34 (53.5)	78 (31.0)
11-12 years	64 (57.1)	48 (52.9)	112 (44.4)
Total	148 (58.7)	104 (41.3)	252 (100.0)
Mean±SD	9.67±2.34 years		

Table-II: Distribution of refractive errors among boys and girls

Variables	Boys Number (percentage)	Girls Number (percentage)	Total Number (percentage)
Myopia	64 (51.6)	39 (47.6)	103 (50.0)
Astigmatism	45 (36.3)	32 (39.0)	77 (37.4)
Hyperopia	15 (12.1)	11 (13.4)	26 (12.6)
Total	124 (60.0)	82 (40.0)	206 (100.0)

Discussion

Uncorrected refractive errors attribute a major percentage to a visual impairment which can cause significant ocular morbidity in children. Awareness building among the teachers, students, community leaders, and guardians can help evaluate the visual status and prevent the children's visual impairment.^{7,8} Refractive error was the cause in 61% of eyes with vision impairment, amblyopia in 12%, other causes in 15%, and unexplained causes in the remaining 13%. Myopia is one, or both eyes are present in 4.1% of children. A higher risk of myopia in children of older age was of borderline statistical significance (P=0.069). With no significant predictors, hyperopia in at least one eye was

present in 0.8% of children. Refractive error was the main cause of visual impairment in children aged 7 and 15 years in rural India. There was a benefit of spectacles in 70% of those with visual acuity of 20/40 or worse in the better eye at baseline.⁹ We assessed 252 children in this study. The mean age of the children was 9.67±2.43 years. The age range was from 7 to 12 years. Boys are 58.7%, and girls are 41.3%. Several studies were done abroad on the patterns of refractive errors among the school going children of rural and urban settings.^{10,11}

Yamamah *et al.* did a cross-sectional analysis of 2070 healthy school children screened for visual impairment from 2009 to 2010 in the cities of South Sinai and their surrounding Bedouin settlements. The study included 1047 boys and 1023 girls, with a mean age of 10.7±3.1 years. The prevalence of visual impairment was potentially higher in girls and those with positive kinship.¹⁰ Children 13 to 15 attending urban schools were most likely to have uncorrected myopia. Hypermetropia was associated with younger age groups and female children.¹¹ In this study, the visual acuity was improved after the corrections of refractive errors in both eyes, and all children were happy to improve their vision with spectacle. The uncorrected visual acuity (VA) was 6/9 to 6/6 in 49.6% of right eyes, and BCVA was improved to 89.5% in that eye. The scenarios were almost the same in left eyes (UCVA-51.5%, BCVA-92.1%). Ametropia is noted in 81.7% of the study children. Myopia is the most common refractive error (50%), and astigmatism (37.4%) in this study's second common refractive error. Hyperopia accounts for only 12.6% of the refractive error. After refractive error correction, visual acuity was significantly improved to 6/6 in 98% of students. Forty-five students (2.01%)

were amblyopic. Refractive error was significantly more prevalent in males (9.76%) than in females (7.48%). Refractive error was significantly high in private schools than in government schools.¹¹ Myopia is the most common (44.79%) variety of refractive errors as found in another study.¹² Besides, myopia (2–6 diopters) is common (48.8%). Myopia was observed to increase as age advanced. Hyperopia and astigmatism initially increased but later decreased with age. The overall prevalence of refractive error was from 7% to 20%.^{10,12} The most common refractive error was myopia (59.8%), followed by hypermetropia (31.0%). The older age group (12-15 years) have a higher prevalence of myopia than the younger (42.5% vs. 17.2%). The prevalence of myopia is high among the urban students compared to 8 the rural ones.¹³⁻¹⁵ Hypermetropia is more common in urban students than in rural ones (6.4% vs. 5.9%). The students from urban settings are more likely to have refractive errors than their rural counterparts.¹³ An increase in the prevalence of myopia and astigmatism was observed in many studies; however, it is not clear whether the occurrence increases were caused by prolonged near-work activities or reduced outdoor activities, or due to a trend among children to spend a significant amount of time using smartphones (mobile), tablets, other computer devices for gaming fascination.¹⁵⁻¹⁹ Reducing near-work tendencies and promoting outdoor activities are helpful to prevent myopia as well as other forms of refractive errors in children.¹⁵

Conclusion

Our data suggest that ametropia (refractive errors) seems very common in primary school children. Myopia is the most common type of

refractive followed by astigmatism and hyperopia. Annual eye examination and assessment of visual acuity are essential for children. We also recommend country-wide epidemiological research on the refractive status of school-going children to obtain a better picture.

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