

Assessment of amblyopia among school going children aged 6-15 years in a city of West Bengal, India: A cross-sectional study

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Abstract

Introduction: Amblyopia is the leading cause of preventable monocular vision loss in children. Refractive error is a common cause of amblyopia, other causes being anisometropia, ocular media opacities, strabismus or a combination of factors. Since amblyopia is avoidable and treatable, early screening and timely treatment are very important.

Objectives: To assess the prevalence and types of amblyopia among 6-15 years old school going children in urban West Bengal, India.

Method: A cross sectional study was conducted for one year among 3882 rural school children aged 6-15 years. A full ophthalmic examination, including refraction, fundoscopy and slit lamp examination was done in children having vision <6/12 without any organic lesion.

Results: Amblyopia was found in 112 (2.9%) children. Common causes of amblyopia observed were anisometropia (33.9%), strabismus (29.5%), meridional amblyopia (14.3%) and combined (13.4%). Amblyopia was higher in males (3.2% vs 2.5%) and in the 11-15-year age group (3.1% vs 2.6%), though it was not statistically significant.

Conclusions: Prevalence of amblyopia was 2.9% in our study population and anisometropia was the commonest (33.9%) type.

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Introduction

Amblyopia or lazy eye is characterized by unilateral or bilateral decrease of visual acuity and is caused by deprivation of pattern vision or abnormal binocular interaction¹. Amblyopia is diagnosed when the difference in the best corrected visual acuity (BCVA) between the two eyes is two or more Snellen lines². In children 50% of causes of blindness are either preventable or treatable³. Refractive error is a common cause of amblyopia, other causes being anisometropia, opacities of the ocular media, strabismus or a combination of factors^{1,2}. Although amblyopia is a common eye problem in children⁴, prevalence is low varying from 0.7% to 5%¹. A prevalence of 4.4% has been reported in New Delhi⁵ and 1.9% in South China⁶ among children aged 5 to 15 years. A study by Kalikiyavi V, *et al*⁷ in India showed prevalence rate of amblyopia to be 1.1%. In a study by Rahi J, *et al*⁸ done in 9 states, combined amblyopia comprised 12.3% severe visual impairment. In a study by Murthy GVS, *et al*⁵ in the urban population, prevalence rate of amblyopia was 4.4%. In Andhra Pradesh, a study by Anjaneyulu K, *et al*⁹ found the prevalence of amblyopia to be 6.6%. The variations in prevalence may be due to the visual acuity criteria, measurement methods and characteristics of the study population¹. Presence of refractive errors in children is often unnoticed by parents due to lack of awareness and knowledge^{10,11}. Late ophthalmological referrals for visual screening and lack of a reliable single test for preschool vision assessment may be other cause of low prevalence of the condition¹². If timely corrective measures are not taken before 8 years (upper limit of critical time for development of amblyopia), lifelong visual impairment can occur¹³. Since amblyopia is avoidable and mostly treatable, early screening and timely treatment are very important to reduce the burden of this disease.

Objectives

- To determine the prevalence of amblyopia in school going children aged 6-15 years in a city of West Bengal.
- To find the types of amblyopia in the study population and the associated factors.

Method

A cross-sectional study was done among 3882 urban school children in the age group of 6-15 years in 12 schools in a city of West Bengal from February 2019 to January 2020. A written informed consent form explaining the details of the study was sent to the principals of the schools for distribution among the teachers and parents two days before the examination. Students present on the day of visit and producing the signed consent forms were included in the study. No follow up visits were done.

Inclusion criteria:

- School going children aged 6 to 15 years
- Children’s vision $\leq 6/12$
- Children whose parents gave informed consent
- Children who were present on the day of examination

Exclusion criteria: Children with ptosis covering the pupil, corneal opacity, congenital ocular anomalies and any other organic eye disorder.

Sample size: Considering prevalence of amblyopia (P)=9% (average of prevalence of 5 studies found as 1.75%, 4.4%, 8.6%, 15.1% and 17.2%)^{5,13,14} and error of 10% (relative precision), the sample size was estimated to be 3882. Participants were enrolled by convenience sampling method.

Two ophthalmic technicians having 2-3 years of experience and one ophthalmologist with prior experience of 4 years performed all examination procedures. A full ophthalmic examination, including refraction, funduscopy and slit lamp examination, was done in children having vision $\leq 6/12$ without any organic lesion. A detailed history was taken about use of spectacles, present and past ocular problems. Visual acuity was recorded using Snellen’s chart for distance and near vision. The visual acuity of children wearing glasses was also checked to assess any change. Objective refraction was performed with Heine retinoscopy (BETA 200) which was followed by subjective refraction till the best corrected visual acuity was achieved. Alternate

cover test was used for distance (6m) and near (33cm) with an accommodative fixation target for ocular alignment assessment. Ocular motility was checked in all gazes to detect any muscular dysfunction. Students, who were found to have a visual acuity equal to or less than 6/12 or 20/40 after correction were advised to attend the ophthalmology department of the medical college for further evaluation.

Operational definitions¹⁵

Amblyopia: was defined as best corrected visual acuity (BCVA) of less than 6/12 bilaterally on the Snellen's chart in the absence of any organic lesion that could result in a decrease in vision.

Anisometric amblyopia: was defined as a difference of refractive error in both eyes of 1.0 D or greater in spherical equivalent, or a 1.5 D or greater difference in astigmatism between both eyes that persisted for at least 4 weeks after spectacle correction, in the absence of any measurable heterotropia at distance or near vision.

Strabismic amblyopia: was defined as amblyopia present in an eye that had constant manifest strabismus.

Meridional amblyopia: was defined as amblyopia which was a result of astigmatism of ≥ 1.5 D in one or both eyes and no associated strabismus.

Mixed amblyopia: was said to occur when more than one cause of amblyopia was present in a single eye.

Ethical issues: Prior approval was taken from the Institutional Ethics Committee of the R. G. Kar Medical College & Hospital, Kolkata, India (No. RKC/1298; dated 01.02.2019). Written informed consent was obtained from the parents of the participating children.

Results

A total of 3882 children aged 6-15 years from 12 schools were enrolled in this study (Table 1) and majority (51.6%) of the children were male (Table-2).

Table 1: Distribution of participants as per school (n=3882)

School	Male	Female	Total
1	180	160	340
2	294	247	541
3	310	281	591
4	130	98	228
5	124	130	254
6	194	182	376
7	80	76	156
8	76	84	160
9	0	64	64
10	118	102	220
11	186	170	356
12	310	286	596
Total	2002	1880	3882

Table-2
Distribution of study population by gender
(n=3882)

Gender	Number (%)
Male	2002 (51.6)
Female	1880 (48.4)

The ages of children ranged from 6 to 15 years, and 50.7% of them belonged to the 11-15-year age group. Out of the 3882 children who were screened, 112 (2.9%) had amblyopia. Amblyopia was found to be more unilateral (76.8%) than bilateral.

Table 3 shows that amblyopia was more prevalent among males (57.1%).

Table 3
Distribution of amblyopia by gender (n=112)

Gender	Number (%)
Male	64 (57.1)
Female	48 (42.9)

Types of amblyopia

Figure 1 shows the prevalence of different types of amblyopia. It was found that the main causes of amblyopia were anisometropia (33.9%), strabismus (29.5%), meridional (14.3%) and combined (13.4%).

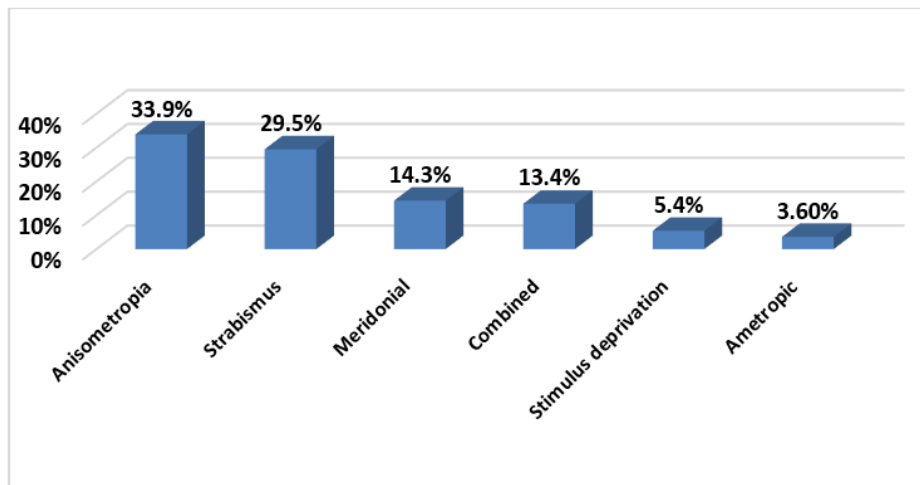


Figure 1: Prevalence of types of amblyopia among study population

Figure 2 shows the type of strabismus. It was found that the esotropia was the more prevalent (53.3%) type of strabismus among the children.

Association of amblyopia with gender

It was found that the prevalence of amblyopia was higher in males (3.2%) but it was not statistically significantly ($p > 0.05$) (Table-4).

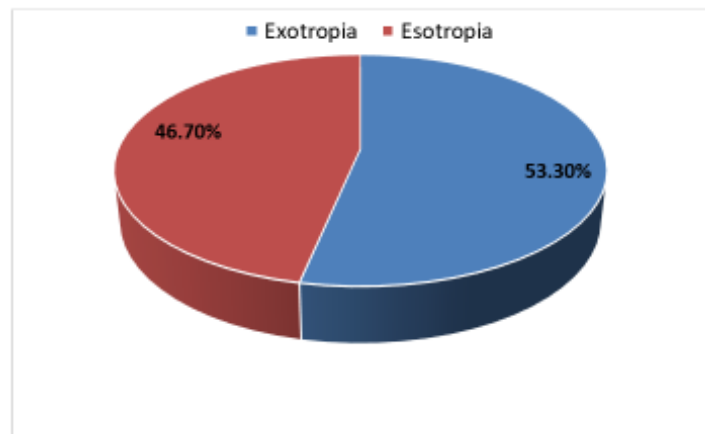


Figure 2: Type of strabismus (n=30)

Table 4: Association of amblyopia with gender (n=3882)

Gender	Amblyopia		Significance
	Yes	No	
Male	64 (3.2%)	1938 (96.8%)	$\chi^2=1.43$ p=0.23 df=1
Female	48 (2.5%)	1832 (97.5%)	

Table 5 shows the age-wise distribution of amblyopia and it was found that amblyopia was most prevalent in children aged 11 years.

Association of amblyopia with age

Table 6 shows the association of amblyopia with age group and it was found that prevalence of amblyopia was higher in the age group 11-15 years (3.1%) but it was not statistically significantly (p>0.05).

Table 5

Age-wise distribution of amblyopia (n=112)

Age	Number (%)
6 years	07 (06.3)
7 years	08 (07.1)
8 years	13 (11.6)
9 years	12 (10.7)
10 years	10 (08.9)
11 years	14 (12.5)
12 years	12 (10.7)
13 years	13 (11.6)
14 years	12 (10.7)
15 years	11 (09.8)

Table 6: Association of amblyopia with age group (n=3882)

Age group	Amblyopia		Significance
	Yes	No	
06 – 10 years	50 (2.6%)	1862 (97.4%)	$\chi^2=0.98$ p=0.32 df=1
11 – 15 years	62 (3.1%)	1908 (96.9%)	

Discussion

The study was done among 3882 school children aged 6-15 years. The prevalence of amblyopia in our study was 2.9% whereas it was reported to be 1.1% by Kalikiyavi V, *et al*⁷, 4.4% by Murthy GVS, *et al*⁵ and 6.6% by Anjaneyulu K, *et al*⁹. In our study, amblyopia was more in males (57.1%) and similar (61%) to the study by Daigavane S, *et al*¹⁶ but Anjaneyulu K, *et al*⁹ and Park K, *et al*¹⁷ reported it to be more in females. In our study, unilateral amblyopia was higher (76.8%) which was similar to studies by Anjaneyulu K, *et al*⁹ but opposite to that of Gupta D, *et al*¹ (58.1% bilateral).

In our study, anisometric amblyopia (34%) was the most common type followed by strabismus (29.5%) and this was similar to the findings by Daigavane S, *et al*¹⁶ (53.8% and 23%). Gupta D, *et al*¹ also reported anisometric amblyopia as the most common type (72%). However, in a study by Menon V, *et al*¹⁵ amblyopia due to hypermetropia was highest (51.7%) followed by anisometric amblyopia (22.1%). In our study, amblyopia was more prevalent in children aged 11-16 years, but it was seen to be more in 5-10 years in the study by Gupta M, *et al*¹³.

Majority of the children did not have any complaints at the time of screening. Screening programmes in school children would detect not only amblyopia, but also the other amblyogenic factors like ametropias, strabismus and visual deprivation, and if timely correction not done, can cause permanent

visual impairment. The results of our study emphasize the need for more screening of school children and awareness programmes for parents and teachers.

Conclusions

Prevalence of amblyopia in children was found to be 2.9% in our study population and anisometropia was the major type of amblyopia observed.

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