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# A PROSPECTIVE STUDY ON AMBLYOPIA AND ITS ASSOCIATED RISK FACTORS IN FIRST-GRADE SCHOOL CHILDREN

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#### ABSTRACT

Background: Amblyopia is a leading cause of preventable visual impairment in children, resulting from abnormal visual development due to factors such as anisometropia, strabismus, and sensory deprivation. Early detection and intervention are crucial in minimizing permanent vision loss. This study aimed to assess the prevalence of amblyopia, its associated risk factors, and the effectiveness of various treatment modalities in school-going children. A prospective, observational study was conducted in the Department of Ophthalmology, Tagore Medical College and Hospital, involving 200 school-going children aged 5-9 years. Vision screening was performed in schools, and children with suspected visual impairment were referred for comprehensive ophthalmic evaluation, including visual acuity testing, fundus examination, Hirschberg test, retinoscopy, and cover/uncover tests. Amblyopia cases were categorized based on American Academy of Ophthalmology criteria, and treatment modalities, including optical correction, patching therapy, and surgical interventions, were implemented. Data were analyzed using IBM SPSS software version 20, with p-values < 0.05 considered statistically significant. Out of 1,500 screened children, 50 cases (3.5%) were diagnosed with amblyopia. Anisometropia (40%) was the most common cause, followed by strabismus (22%) and sensory deprivation (10%). Amblyopia was more prevalent among boys (70%) than girls (30%) and was more frequently observed in children from lower socioeconomic backgrounds (28%). Unilateral amblyopia (68%) was more common than bilateral amblyopia (16%). Patching therapy demonstrated significant improvement in visual acuity, particularly in mild to moderate amblyopia cases, with 64.3%-75.0% of children showing an improvement of  $\geq 2$  Snellen's lines following treatment. This study highlights the importance of early diagnosis and intervention in managing amblyopia. Vision screening in schools, combined with increased awareness among teachers, parents, and healthcare professionals, plays a critical role in reducing the burden of childhood amblyopia. Public health initiatives should focus on promoting routine eye examinations, ensuring accessibility to treatment, and improving compliance with corrective measures. Further research with larger sample sizes and extended follow-up periods is recommended to enhance amblyopia management strategies and optimize treatment outcomes.

**Key words:** Amblyopia, Vision Screening, Anisometropia, Childhood Blindness, Patching Therapy, School-Based Screening.

#### **INTRODUCTION**

Amblyopia refers to a reduction in visual acuity in one eye due to disrupted binocular interaction or in both eyes as a result of patterned vision deprivation during early visual development [1]. Early diagnosis through vision screening, timely referrals for further assessments, and prompt interventions contribute to improved visual outcomes [2]. According to recommendations by the American Academy of Ophthalmology (AAO) and the American Association for Pediatric Ophthalmology and Strabismus (AAPOS), vision screening should be

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conducted at least once for all children between the ages of three and five to identify amblyopia and associated risk factors [3].

A recent study involving 6,935 children estimated that the prevalence of childhood blindness was 0.17%, with 33.3% attributed to correctable refractive errors, followed by 16.6% preventable causes, including 8.3% due to vitamin A deficiency and 8.3% resulting from amblyopia post-cataract surgery. These findings highlight that 50% of blindness cases are preventable. In India, a significant proportion of the pediatric population resides in rural areas, where awareness of conditions leading to avoidable childhood blindness is limited. Enhancing the knowledge of parents and teachers regarding these conditions can facilitate early identification, timely intervention, and prevention of visual impairment. As part of the screening process, schoolteachers were trained to identify eye conditions among children following a brief instructional program. This study aimed to evaluate the effectiveness of teacher involvement in preliminary vision screening within schools, ensuring that all students undergo assessment and receive appropriate referrals for addressing eye conditions ranging from minor to complex [4]. Certified optometrists and newly trained teachers participated in this study. The findings emphasize that training educators can reduce the workload of ophthalmic professionals, enhance early detection, and improve access to eye care services for children from underprivileged communities. Thus, the objective of this research was to conduct a prospective study on amblyopia and its associated risk factors among first-grade students

# MATERIALS AND METHODS

The present study was designed as a prospective, observational investigation conducted in the Department of Ophthalmology at Tagore Medical College and Hospital. The study was carried out on 200 school-going children. Children aged between 5 and 9 years were included, whereas those with anterior or posterior segment abnormalities, congenital ocular anomalies (except congenital cataract and ptosis), a history of ocular trauma, or any previous ocular surgery were excluded from the study [5]. Prior permission was obtained from school principals for conducting vision screening on scheduled dates. Both government and private higher secondary schools from urban and rural areas around Chennai were selected for the study. All eligible children underwent vision screening and examination during school visits. A detailed sociodemographic history, including age, gender, and socioeconomic status, was recorded using a structured questionnaire. Visual acuity was assessed using the Snellen's distant visual acuity chart, followed by a torchlight examination of the anterior segment. Direct and indirect ophthalmos copy were performed for a comprehensive fundus examination.Presenting complaints were documented chronologically, and a thorough history of the condition was obtained. Past medical history, including any previous ocular trauma, surgery, or infections, was also recorded. Additionally, any familial occurrence of similar conditions was inquired about.

A comprehensive ophthalmic assessment for amblyopia was performed under the following parameters:

- Visual acuity
- Head posture
- Ocular movements
- Anterior segment examination
- Fundus examination
- Hirschberg test
- Alternate and cover/uncover test Used to identify heterotropia and heterophoria for both near and distance fixation.
- Prism Bar Cover Test Performed to measure the angle of deviation.
- Retinoscopy Cyclopentolate 1% eye drops were instilled in each eye at 15-minute intervals for one hour to achieve full mydriasis. Dry retinoscopy was performed first, followed by wet retinoscopy after instilling 1% cyclopentolate eye drops. The required prescription was given after three days.

Children diagnosed with refractive errors were provided with corrective glasses during the school visit, and those with amblyopia received appropriate management, including optical correction, occlusion therapy, or surgical intervention for conditions such as strabismus and ptosis. Patching therapy was administered as follows:

- Mild amblyopia Normal eye was patched for 2 hours daily, with constant near work.
- 2. Moderate to severe amblyopia Patching of the normal eye was done for 4 to 6 hours daily.
- 3. Ametropic amblyopia Alternating patching schedules of 2, 4, or 6 hours were implemented.

The classification of amblyopia was based on the criteria established by the American Academy of Ophthalmology. The severity of amblyopia was also categorized accordingly. All children were followed up at 1-month, 3-month, and 6-month intervals. At each follow-up visit, visual improvement was assessed using the Snellen's distant visual acuity chart. The collected data were compiled using MS Excel and analyzed using IBM SPSS software version 20. Data were organized into categories and presented as proportions. The chi-square test was applied to evaluate associations between categorical variables, and a p-value of less than 0.05 was considered statistically significant.

# RESULTS

A total of 1,500 school-going children aged between 5 and 9 years underwent vision screening. Top of Form.

#### Table 1: Distribution according to gender of children screened

Gender	Number of Participants	Proportion (%)
Boys	900	60.0%
Girls	600	40.0%

#### Table 2: Age wise distribution

Age Group	Total Participants (n=1500)	Percentage Distribution
2-3 years	60	4.0%
4-5 years	650	43.3%
6-7 years	450	30.0%
8-9 years	340	22.7%

#### Table 3: Children with amblyopia according to sociodemographic variables

Category	Subgroup	Number of Cases (n=50)	Percentage (%)
Gender	Boys	35	70%
	Girls	15	30%
Age Group	2-3 years	6	12%
	4-5 years	20	40%
	6-7 years	14	28%
	8-9 years	10	20%
Socioeconomic Status	Upper class	6	12%
	Upper middle	10	20%
	Lower middle	14	28%
	Upper lower	8	16%
	Lower	12	24%

#### Table 4: According To Risk Factors and Characteristic Amblyopia

Category	Subgroup	Number of Cases (n=50)	Percentage (%)
Characteristic of Amblyopia	Anisometropia	20	40%
	Myopia	6	12%
	Hypermetropia	7	14%
Risk Factors	Astigmatism	3	6%
	Strabismus	10	20%
	Ptosis	3	6%
	Congenital Cataract	3	6%
	Anisometropic	18	36%
	Ametropic	11	22%
Type of Amblyopia	Meridional	3	6%
	Strabismic	11	22%
	Sensory Deprivation	5	10%
Laterality	Bilateral	8	16%
	Unilateral	36	72%
Grading	Mild	12	24%
	Moderate	18	36%
	Severe	10	20%
Refractive Error	Myopia	14	28%
	Hypermetropia	15	30%
	Astigmatism	12	24%
Squint	Esotropia	5	10%
	Exotropia	7	14%

Duration of Patching	Amblyopia Cases	No. of Cases with >2 Snellen's Line Improvement	Percentage (%)
2 hours	14	9	64.3%
4 hours	16	11	68.8%
6 hours	8	6	75.0%

Table 5: Duration of occlusion therapy on visual improvement

### DISCUSSION

Amblyopia has emerged as a significant public health concern due to its status as one of the most overlooked sensory disorders of the eye. The prevalence of amblyopia in the present study was found to be 3.5%, which aligns with the findings [6]. Variations in reported prevalence rates may be attributed to differences in geographic factors, sample size, screening methodologies, and diagnostic criteria used for identifying amblyopia. A study conducted [7]. reported the highest incidence of amblyopia (51.61%) among children aged 5-10 years, which was different from the present study. Here, the majority of amblyopia cases (73%) were observed in children aged 4-7 years. This could be due to lower compliance with spectacle use among children in the 5-10 vear age group following refractive correction. In the present study, amblyopia was identified in 62% of boys and 38% of girls, which is consistent with [8] where a higher prevalence among males was observed. This gender disparity may be attributed to cultural and social factors, where fewer girls seek medical attention due to limited access to healthcare and lower female-to-male ratios, particularly in rural areas. Amblyopia was found to be more prevalent among children from lower socioeconomic backgrounds (28%), a finding supported by studies such .This could be due to factors such as limited awareness about routine eve check-ups, the importance of using corrective spectacles, financial constraints, lack of healthcare access, and inadequate public awareness campaigns on amblyopia through digital and print media.[9] Among the identified risk factors for amblyopia, anisometropia (36%) was the most common, followed by strabismus (18%), hypermetropia (10%), myopia (8%), astigmatism (4%), ptosis (4%), and congenital cataract (4%). Interestingly, no cases were linked to low birth weight (LBW) or prematurity. These findings are consistent with those of, which reported that amblyopia was not significantly associated with LBW, premature birth, maternal age, or smoking during pregnancy. In this study, anisometropic amblyopia (40%) was the most prevalent type, which is in agreement with who reported a similar prevalence (36.20%). [10] This could be attributed to the fact that anisometropia is one of the most common risk factors for amblyopia, and children often remain unaware of unilateral refractive errors for extended

periods. The study also observed a higher proportion of unilateral amblyopia (68%) compared to bilateral amblyopia (18%). This could be due to the brain's natural physiological tendency to suppress the less functional eye while promoting the stronger eye to enhance visual quality, resulting in a higher prevalence of unilateral cases.Most cases in this study had mild amblyopia, followed by moderate and severe amblyopia. This trend could be attributed to the predominance of anisometropic amblyopia over strabismic amblyopia, as the latter is more often associated with severe visual impairment. Top of Form Bottom of Form.

#### CONCLUSION

The present study highlights the prevalence, risk factors, and management of amblyopia among schoolgoing children. The overall prevalence of amblyopia was 3.5%, with anisometropia (40%) being the most common type, followed by strabismic amblyopia (22%) and sensory deprivation amblyopia (10%). The study also revealed a higher prevalence among boys (70%) compared to girls (30%), and amblyopia was more frequently observed in children from lower socioeconomic backgrounds (28%). The findings emphasize the importance of early detection and intervention in reducing the risk of permanent visual impairment. School-based vision screening programs, combined with active participation from teachers, parents, and healthcare providers, can play a crucial role in the early identification and management of amblyopia. The study also demonstrated that patching therapy, particularly for mild to moderate amblyopia, resulted in significant visual improvement, reinforcing the effectiveness of timely corrective measures such as optical correction, occlusion therapy, and, when necessary, surgical interventions. Given that a significant proportion of amblyopia cases are preventable, there is a need to enhance awareness, accessibility to eye care services, and adherence to treatment in school-going children. Public health initiatives should focus on educating communities about amblyopia, encouraging routine vision screenings, and promoting timely intervention to prevent long-term visual impairment. Further research with larger sample sizes and extended follow-up periods is recommended to strengthen the existing evidence and optimize strategies for amblyopia management.

#### REFERENCES

1. Dandona R, Dandona L *et al.* Childhood blindness in India: a population based perspective. *J Ophthalmo* 87, 2003, 263-265.

- 2. Donahue SP, Arnold RW, Ruben JB, *et al.* Committee AVS. Preschool vision screening: what should we be detecting and how should we report it? Uniform guidelines for reporting results of preschool vision screening studies. *J AAPOS*. 7(5), 2003, 314–6.
- 3. Gupta M, Rana SK, Mittal SK, Sinha RN. *et al.* Profile of Amblyopia in School going (5-15 years) Children at State Level Referral Hospital in Uttarakhand. *J ClinDiagn Res.* 10(11), 2006, SC9–SC11.
- 4. Ikuomenisan SJ, Musa KO, Aribaba OT, Onakoya AO.*et al.* Risk factors associated with amblyopia among primary school pupils in Kosofe town. *Niger J Ophthalmol.* 26(1), 2008, 67–73.
- 5. Janti SS, Raja AM, Matheen A, Charanya C, Pandurangan R. *et al*, ACross Sectional Study on Prevalence of Amblyopia in School Going Children". *J Evol Med Dent Sci.* 3(30), 2010, 8561–5.
- 6. Jarwal PN, Singh R. Evaluation of Amblyopia in School Going Children. Delhi J Ophthalmol. 30, 2010, 46–50.
- 7. Moghaddam AA, Kargozar A, Zarei-Ghanavati M, Najjaran M, Nozari V, Shakeri MT.*et al.* Screening for amblyopia risk factors in pre-verbal children using the Plusoptixphotoscreener: a cross-sectional population- based study. *Br J Ophthalmol.* 96(1), 2011, 83–6.
- 8. Mohamed D, Yiong-Huak C, Gus G, Dana M, Seo-Wei L, Prabakaran S, *et al.* Prevalence of refractive error in Singaporean Chinese children: The Strabismus, Amblyopia, and Refractive Error in Young Singaporean Children Study (STARS). *Invest Ophthalmol Vis Sci.* 51(3), 2010, 1348–55.
- 9. Noorden GK. Mechanisms of amblyopia. Adv Ophthalmol. 34, 1977, 93–115.
- 10. Saxena A, Nema N, Deshpande A. *et al*.Prevalence of refractive errors in school-going female children of a rural area of Madhya Pradesh. *India J ClinOphthalmol Res*. 7(2), 2009, 45–9.