

Clinical Profile of Amblyopia in Tertiary Care – A Cross Sectional Study

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ABSTRACT

Background: Amblyopia is a leading cause of preventable visual impairment in children and young adults, with significant implications for visual development. Understanding its clinical profile is essential for early detection and effective management.

Aim: To evaluate the clinical profile, refractive characteristics, and severity of amblyopia in patients attending a tertiary care teaching hospital in western India.

Methods: This cross-sectional prospective study was conducted over six months at a tertiary care teaching hospital. A total of 120 patients diagnosed with amblyopia were recruited using purposive sampling. Patients with strabismic, anisometropic, combined, ametropic, and meridional amblyopia were included. All participants underwent comprehensive ophthalmic evaluation including best-corrected visual acuity (BCVA) assessment, cycloplegic refraction using 1% cyclopentolate or atropine, orthoptic evaluation, slit-lamp examination, and fundus examination. Amblyopia severity was categorized as mild, moderate, or severe.

Results: Among 120 patients, the majority belonged to the 11–20-year age group (40%), with a female predominance (55.8%). Strabismic amblyopia was the most common subtype (39.2%), followed by anisometropic (28.3%). Unilateral involvement predominated in strabismic (89.4%) and anisometropic (88.2%) cases, while ametropic amblyopia was largely bilateral (68.7%). Hypermetropia was the most common refractive error (52.2%), particularly in anisometropic and combined amblyopia. Moderate visual impairment was the most frequent presentation in strabismic (57.4%) and anisometropic (73.5%) groups, whereas ametropic amblyopia was exclusively mild.

Conclusion: Strabismic and anisometropic amblyopia are the predominant subtypes, with hypermetropia and astigmatism being major amblyogenic factors. The predominance of moderate visual impairment highlights delayed detection. Early vision screening and timely refractive correction are essential to reduce the burden of amblyopia.

Keywords: Amblyopia; Strabismic; Anisometropic; Refractive errors; Visual acuity; Cycloplegic refraction

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INTRODUCTION

Lazy eye or amblyopia is a neurodevelopmental visual defect that has low best-corrected visual acuity (BCVA) in one or both eyes that cannot be explained by abnormal development of the eye or visual pathways (1). It is common in early childhood, a critical visual development phase when visual experience is abnormal, including strabismus, refractive errors, or visual axis obstruction which interferes with the development of the visual cortex (2, 3).

It is estimated that globally, amblyopia occurs in 1-5% of the population, with an estimated population of 99.2 million individuals having the condition as at 2019 (4).

Although it is a preventable cause of monocular visual impairment, it still poses a serious public health issue because the untreated cases may result in permanent, irreversible visual impairment and severely affected stereopsis. The socioeconomic and psychological consequences are immense; the impacted individuals tend to have slower reading rates, decreased motor skills and less quality of life (5).

In tertiary care units, especially in developing countries, clinical profiles tend to show that refractive amblyopia (anisometropic or isometropic) is more common, then strabismic, and stimulus deprivation. A significant gap between early screening and community awareness is

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demonstrated by the large number of patients that present at an advanced age (after the classic age of plasticity of visual development) (6).

This cross-sectional study will examine the clinical profile of amblyopia in a tertiary care hospital with the aim of assessing the type, severity and risk factor associated with it. Through recording these clinical features, the research aims at giving the groundwork to reinforce the pediatric eye care services and promote the functioning of effective early-intervention programs.

METHODOLOGY

It was a cross-sectional and prospective study at a Tertiary care Teaching Hospital in Trichy that was approved by the Institutional Ethics Committee according to the Declaration of Helsinki. The research was done within 6 months between November 2025 and April 2025. It consisted of 120 patients with amblyopia who were recruited using purposive sampling. The inclusion criteria were patients with amblyopia related to strabismus, anisometropia, or both, ametropic and meridional subtypes. Those with stimulus deprivation amblyopia, previous intraocular surgery, and uncooperative

individuals were excluded as well as those with confounding ocular pathology.

Each participant was comprehensively clinically assessed, starting with the determination of best-corrected visual acuity (BCVA) with the help of apt charts depending on the age and cognitive status. The visual impairment was categorized as mild, moderate, and severe. To establish the refractive status, Cyclophilic refraction was conducted and included 1% Cyclopentolate or Atropine ointment, which was used to classify cases as hypermetropic, myopic or emmetropic. An orthoptic test was used to measure ocular alignment and motility with or without slit-lamp biomicroscopy and dilated fundus examination to exclude structural ocular diseases. Strabismic, anisometrical, combined, ametrical, and meridional were described as the diagnosis of amblyopia depending on the selected clinical criteria.

Statistical analysis:

Data analysis was performed with the SPSS version 25.0 utilizing descriptive statistics and Chi-square tests to identify the correlations between the types of amblyopia and clinical parameters and the significance value of 0.05.

RESULTS

Table 1: Demographic Characteristics

Demographic Parameter	Strabismic (n=47)	Anisometropic (n=34)	Combined (n=18)	Ametropic (n=16)	Meridional (n=5)
Age group (yrs), n					
0–10	19	12	2	4	0
11–20	21	12	4	10	1
>20	7	10	12	2	4
Sex, n (%)					
Male	21 (44.7)	15 (44.1)	8 (44.4)	7 (43.8)	2 (40.0)
Female	26 (55.3)	19 (55.9)	10 (55.6)	9 (56.2)	3 (60.0)
Laterality, n (%)					
Unilateral	42 (89.4)	30 (88.2)	14 (77.8)	5 (31.3)	4 (80.0)
Bilateral	5 (10.6)	4 (11.8)	4 (22.2)	11 (68.7)	1 (20.0)
Mean age at diagnosis (yrs) ± SD	9.2 ± 6.1	10.1 ± 7.2	14.5 ± 8.3	8.7 ± 5.9	18.1 ± 9.4
Family history, n (%)	11 (23.4)	6 (17.6)	5 (27.8)	2 (12.5)	0 (0)

Among 120 patients, the majority were aged 11–20 years (48/120, 40.0%), with strabismic cases contributing 21/47 (44.7%) and anisometropic 12/34 (35.3%). Females predominated overall (67/120, 55.8%), with proportions ranging from 43.8% in ametropic to 60.0% in meridional amblyopia. Laterality was predominantly unilateral in strabismic (42/47, 89.4%) and anisometropic (30/34,

88.2%) groups, whereas bilateral involvement was common in ametropic cases (11/16, 68.7%). Mean age at diagnosis ranged from 8.7 ± 5.9 years (ametropic) to 18.1 ± 9.4 years (meridional). Family history was reported in 24/120 (20.0%), most frequently in strabismic amblyopia (11/47, 23.4%).

Table 2: Refractive Error Distribution by Amblyopia Type

Type	Hypermetropia	Myopia	Emmetropia	p-value
Strabismic	20	15	12	0.001
Anisometropic	21	10	3	
Combined	14	4	0	
Ametropic	5	1	10	

Hypermetropia was the predominant refractive error (60/115, 52.2%), particularly in anisometropic (21/34,

61.8%) and combined amblyopia (14/18, 77.8%). Myopia accounted for 30/115 (26.1%), highest in strabismic cases

(15/47, 31.9%). Emmetropia was observed in 25/115 (21.7%), most frequent in ametropic amblyopia (10/16, 62.5%). The distribution was statistically significant for strabismic amblyopia ($p = 0.001$).

Table 3. Detailed Refractive Profile

Type	Hypermetropia	Hypermetropia + Astigmatism	Myopia	Myopia + Astigmatism	p-value
Strabismic	16	4	11	16	0.001
Anisometropic	13	8	8	5	
Combined	4	10	2	2	
Ametropic	4	1	1	10	

Within strabismic amblyopia ($n=47$), hypermetropia (16/47, 34.0%) and myopia with astigmatism (16/47, 34.0%) were equally common, while isolated myopia accounted for 11/47 (23.4%). Anisometropic cases showed balanced distribution across hypermetropia (13/34, 38.2%), hypermetropia with astigmatism (8/34, 23.5%),

and myopia (8/34, 23.5%). Combined amblyopia was dominated by hypermetropia with astigmatism (10/18, 55.6%). Ametropic amblyopia was largely myopia with astigmatism (10/16, 62.5%). The strabismic group demonstrated significant variation ($p = 0.001$).

Table 4: Visual Acuity Severity by Amblyopia Type

Type	Mild (6/12 – 6/24)	Moderate (6/36 – 6/60)	Severe ($\leq 6/60$)	p-value
Strabismic	12	27	8	0.001
Anisometropic	9	25	0	
Combined	9	7	2	
Ametropic	16	0	0	
Meridional	3	2	0	

Strabismic amblyopia ($n=47$) was predominantly moderate (27/47, 57.4%), with severe cases in 8/47 (17.0%) ($p = 0.001$). Anisometropic amblyopia ($n=34$) was also mainly moderate (25/34, 73.5%), with no severe cases. Combined amblyopia ($n=18$) showed a balanced distribution: mild 9/18 (50.0%), moderate 7/18 (38.9%), severe 2/18 (11.1%). Ametropic amblyopia ($n=16$) was exclusively mild (100%). Meridional amblyopia ($n=5$) presented with mild 3/5 (60.0%) and moderate 2/5 (40.0%) impairment.

DISCUSSION

In this study, most of the patients were aged between 11 and 20 (40%), but the mean age at diagnosis differed between the subtypes of amblyopia. This is an indication of late diagnosis, particularly in anisometropic and combined amblyopia where the symptoms are usually subtle. The same trends have been mentioned in school and hospital based studies where the incidence of amblyopia is often detected in adolescence because of the heightened visual demand at this stage (6,7). A female predominance (55.8%) was observed in this study. Although some have found a lack of significant gender disparity or minor male superiority, others have shown female dominance which is probably due to differences in sociocultural and access to healthcare (8,9).

Unilateral amblyopia was the most common in strabismic (89.4) and anisometropic (88.2) types, ametropic amblyopia was more often bilateral (68.7). These results are in line with known pathophysiology and previous epidemiological research. Attebo K et al reported that there are close relations between anisometric/strabismic causes and unilateral amblyopia (11). Equally, Robaei D et

al indicated a greater prevalence of bilateral amblyopia in case of ametropic bilateral amblyopia (12).

The most frequently seen refractive error (52.2) was hypermetropia, especially in anisometropic and combined amblyopia. This is in line with the past literature that has found hypermetropia to be one of the major amblyogenic factors because of the long-term retinal defocus in visual development (13). Strabismic and ametropic amblyopia were more commonly found to be associated with myopia and myopic astigmatism. The statistically significant difference in the strabismic group ($p = 0.001$) is consistent with previous results that refractive heterogeneity is a factor in the severity of amblyopia (14).

Astigmatism became apparent, particularly in combination with spherical errors, in different subtypes, especially combined and ametropic amblyopia. This is consistent with the research by Gwiazda J et al which depicts the amblyogenic capability of uncorrected astigmatism particularly meridional blur (15). Moderate amblyopia was the most frequently observed presentation in strabismic (57.4%) and anisometropic (73.5%) groups and severe amblyopia was largely restricted to strabismic groups. The amblyopia was ametropic, and mild only. These data are in line with the findings of the Pediatric Eye Disease Investigator Group that showed that strabismic amblyopia is more likely to be associated with more severe visual impairment because of early onset suppression (16). Conversely, ametropic amblyopia is usually associated with less severe bilateral defects.

The fact that no cases of severe amblyopia were found in the case of anisometropic cases in the current study is slightly different than some reports, perhaps because of

previous diagnosis or referral bias in tertiary care environments (17). In 20 percent of the cases, there was positive family history especially in strabismic amblyopia. This favors the genetic predisposition in the development of amblyopia since cases of familial aggregation of refractive errors and strabismus has been reported (18).

Strengths and Limitations

This paper presents a subtype based clinical profile of amblyopia in a tertiary care group. But it is restricted in its generalizability by its hospital-based design. There was also no assessment of the treatment outcomes.

CONCLUSION

This paper identifies strabismic amblyopia as the most prevalent subtype of amblyopia in a tertiary care unit, and anisometropic amblyopia. It highlights the commonness of moderate visual impairment with strabismic and anisometropic cases whereas ametropic amblyopia has slight impairments. It is observed that there is a strong association between hypermetropia and amblyopia especially when coupled with astigmatism. Mean age of diagnosis is frequently beyond the optimal early childhood range, and severe visual loss in almost 17% of strabismic patients. This underlines the need for standardized pediatric vision screening and public health initiatives focused on early refractive correction to prevent permanent visual impairment. The early diagnosis and proper refractive treatment are critical to effective amblyopia treatment and better visualization.

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