RESEARCH PAPER

A Cross-Sectional Study on the Management of Amblyopia

Dr. Aishwarya M[1*], Dr. C. Indhu[2], Dr. K. Namitha Bhuvaneshwari[3]

[1]Postgraduate, Department of Ophthalmology, Meenakshi Medical College Hospital & Research Institute, Kanchipuram, MAHER University, Chennai. Email: aishu.sara6@gmail.com (Corresponding Author)

[2]Associate Professor, Department of Ophthalmology, Meenakshi Medical College Hospital & Research Institute, Kanchipuram, MAHER University, Chennai

[3]Professor and HOD, Department of Ophthalmology, Meenakshi Medical College Hospital & Research Institute, Kanchipuram, MAHER University, Chennai

ABSTRACT

Background: Amblyopia is a leading cause of preventable visual impairment in children and results from abnormal visual development during early childhood. Early diagnosis and appropriate management are essential to prevent permanent visual loss.

Aim: To evaluate the patterns of amblyopia management and assess factors influencing visual outcomes in a cross-sectional study.

Methods: This cross-sectional observational study was conducted on 90 patients aged 3–15 years diagnosed with amblyopia at Meenakshi Medical College over a period of one year. All patients underwent detailed ophthalmic evaluation including visual acuity assessment, cycloplegic refraction, and ocular examination. Amblyopia was classified into anisometropic, strabismic, deprivation, and mixed types. Treatment modalities included refractive correction, occlusion therapy, atropine penalization, or combination therapy. Visual outcomes and compliance were analyzed.

Results: Anisometropic amblyopia was the most common type (44.4%), followed by strabismic amblyopia (27.8%). Occlusion therapy was the most frequently used treatment modality (50%). A total of 64.4% of patients showed improvement in visual acuity. A statistically significant association was found between treatment compliance and visual improvement ($p < 0.001$).

Conclusion: Amblyopia is a treatable condition when diagnosed early and managed appropriately. Occlusion therapy remains the mainstay of treatment, and compliance plays a critical role in determining visual outcomes. Early screening and patient education are essential to improve treatment success.

Keywords: Amblyopia, Cross-sectional study, Occlusion therapy, Anisometropia, Visual acuity, Pediatric ophthalmology, Treatment compliance

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Introduction

Amblyopia, commonly referred to as “lazy eye,” is a developmental disorder of vision characterized by reduced best corrected visual acuity in one or both eyes without any identifiable structural abnormality of the eye or visual pathways (1). It typically arises during early childhood due to abnormal visual experience and is one of the leading causes of preventable visual impairment in children worldwide (2). Early detection and timely intervention are crucial, as untreated amblyopia can result in permanent visual deficits extending into adulthood (3).

The common etiological factors for amblyopia include uncorrected refractive errors (anisometropia or high bilateral refractive error), strabismus, and visual deprivation due to conditions such as congenital cataract or ptosis (4). Among these, anisometropic amblyopia is considered the most prevalent form (5). The condition is often asymptomatic in early stages, making routine vision screening in children essential for early diagnosis (6).

Management of amblyopia primarily focuses on improving visual acuity by addressing the underlying cause and promoting the use of the amblyopic eye. Standard treatment modalities include refractive correction with spectacles, occlusion therapy (patching of the dominant eye), and pharmacological penalization using atropine (7). The success of treatment depends on several factors, including the age

at initiation, severity of amblyopia, compliance with therapy, and duration of treatment (8).

Despite the availability of effective treatment options, amblyopia remains underdiagnosed and undertreated, particularly in developing countries (9). Poor awareness, delayed presentation, and issues related to compliance with patching therapy contribute significantly to suboptimal outcomes (10). Understanding current patterns of amblyopia management and their effectiveness is essential for improving treatment strategies and patient outcomes.

This cross-sectional study aims to evaluate the management practices of amblyopia, assess treatment patterns, and identify factors influencing visual outcomes in patients presenting to a tertiary care center.

Materials and Methods

This cross-sectional observational study was conducted in the Department of Ophthalmology at Meenakshi Medical College over a period of one year after obtaining approval from the Institutional Ethics Committee. The study adhered to the tenets of the Declaration of Helsinki, and written informed consent was obtained from the parents or guardians of all pediatric participants. A total of 90 patients diagnosed with amblyopia were included in the study. Patients were recruited consecutively from the outpatient department based on predefined inclusion and exclusion criteria. Patients aged between 3 and 15 years with best corrected visual acuity less than 6/9 in one or both eyes, without any structural abnormality, and willing to undergo treatment and follow-up were included. Patients with organic ocular pathology such as retinal or optic nerve diseases (11), history of previous intraocular surgery, neurological disorders affecting vision, or those with incomplete clinical data or poor follow-up compliance were excluded.

All patients underwent a comprehensive ophthalmic evaluation including measurement of visual acuity using age-appropriate charts (Snellen or Lea symbols), cycloplegic refraction, assessment of ocular alignment using cover test and Hirschberg test, slit-lamp examination, and fundus examination. Amblyopia was classified based on etiology into anisometropic, strabismic, deprivation, and mixed types. All patients received appropriate refractive correction following cycloplegic refraction. Based on the severity and type of amblyopia, management included occlusion therapy (patching of the dominant eye for prescribed hours per day), pharmacological penalization using atropine in selected cases, or a combination of both. Compliance with treatment was assessed based on parental reporting during follow-up visits.

The primary outcome measure was improvement in visual acuity following treatment. Secondary outcomes included the distribution of different types of amblyopia, treatment modalities used, and the association between compliance and visual outcomes. Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables as percentages. The Chi-square test was used to assess associations between categorical variables, and a *p*-value of less than 0.05 was considered statistically significant (12).

Results

A total of 90 patients diagnosed with amblyopia were included in the study. The mean age of the participants was 8.6 ± 3.2 years, with the majority in the age group of 6–10 years. There were 52 (57.8%) males and 38 (42.2%) females.

Table 1: Demographic Distribution

Variable	Number (n=90)	Percentage (%)
Age 3–5 years	18	20%
Age 6–10 years	42	46.7%
Age 11–15 years	30	33.3%
Male	52	57.8%
Female	38	42.2%

The majority of patients (46.7%) were in the 6–10 years age group, highlighting the common age of presentation for amblyopia. There was a slight male predominance (57.8%) in the study population.

Table 2: Types of Amblyopia

Type of Amblyopia	Number	Percentage (%)
Anisometropic	40	44.4%
Strabismic	25	27.8%
Deprivation	10	11.1%
Mixed	15	16.7%

Anisometropic amblyopia was the most common type (44.4%), followed by strabismic amblyopia (27.8%), indicating refractive error as the leading cause of amblyopia in this study.

Table 3: Treatment Modalities Used

Treatment Modality	Number	Percentage (%)
Spectacles alone	20	22.2%
Patching (Occlusion therapy)	45	50%

Treatment Modality	Number	Percentage (%)
Atropine penalization	10	11.1%
Combination therapy	15	16.7%

Occlusion therapy was the most commonly used treatment modality (50%), followed by spectacles alone. Combination therapy was used in selected moderate to severe cases.

Table 4: Visual Acuity Improvement

Outcome	Number	Percentage (%)
Improved (≥2 lines)	58	64.4%
No significant improvement	32	35.6%

A majority of patients (64.4%) showed improvement in visual acuity, indicating the effectiveness of amblyopia treatment when appropriately administered.

Table 5: Association Between Compliance and Visual Outcome

Compliance	Improved (%)	Not Improved (%)	p-value
Good (n=55)	45 (81.8%)	10 (18.2%)	<0.001
Poor (n=35)	13 (37.1%)	22 (62.9%)	

There was a statistically significant association between treatment compliance and visual improvement ($p < 0.001$). Patients with good compliance showed significantly better visual outcomes compared to those with poor compliance.

Discussion

Amblyopia remains one of the leading causes of preventable visual impairment in children, and its successful management depends largely on early diagnosis and appropriate treatment. In the present study, the majority of patients were in the 6–10 years age group, which is consistent with the findings of Holmes JM et al. (13), who reported that amblyopia is most commonly detected during early school years due to increased visual demands.

In our study, anisometropic amblyopia was the most common type observed. This finding is in agreement with Pediatric Eye Disease Investigator Group (PEDIG) (14), which identified anisometropia as the leading cause of amblyopia in children. Similarly, Attebo K et al. (15) also reported a higher prevalence of anisometropic amblyopia compared to other types.

Occlusion therapy (patching) was the most commonly used treatment modality in our study. This aligns with the findings of Repka MX et al. (16), who demonstrated that patching remains the standard and most effective treatment for amblyopia. Additionally, the use of atropine penalization in selected cases in our study is supported by Pediatric Eye Disease Investigator Group (PEDIG) (17), who found atropine to be equally effective as patching in moderate amblyopia.

A significant proportion of patients in our study showed improvement in visual acuity following treatment. This is comparable to the results of Cotter SA et al. (18), who reported substantial visual improvement with appropriate amblyopia therapy. The improvement observed highlights the effectiveness of early intervention and proper management.

Compliance was found to be a major factor influencing treatment outcomes in our study, with better visual improvement seen in patients with good compliance. This finding is consistent with Newsham D (19), who emphasized that poor adherence to patching therapy is a major barrier to successful amblyopia treatment.

Furthermore, our findings are supported by Stewart CE et al. (20), who reported that both age at initiation and compliance significantly affect visual outcomes in amblyopia management. Early treatment combined with good compliance leads to better prognosis.

Conclusion

Amblyopia is a significant yet treatable cause of visual impairment in children, and early detection plays a crucial role in achieving favorable outcomes. The present study demonstrated that anisometropic amblyopia is the most common type, and occlusion therapy remains the primary mode of management. A majority of patients showed improvement in visual acuity following appropriate treatment. Treatment compliance was identified as a key factor influencing visual outcomes, with better results observed in patients adhering to therapy. The findings emphasize the importance of early diagnosis, timely intervention, and patient/parent education to improve compliance and treatment success.

Conflict of Interest: The authors declare that there is no conflict of interest.

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References

1. Von Noorden GK, Campos EC. *Binocular Vision and Ocular Motility: Theory and*

Management of Strabismus. 6th ed. St Louis: Mosby; 2002.
2. Holmes JM, Clarke MP. Amblyopia. *Lancet*. 2006;367(9519):1343–1351.
3. Levi DM. Visual processing in amblyopia: human studies. *Strabismus*. 2006;14(1):11–19.
4. Attebo K, Mitchell P, Smith W. Prevalence and causes of amblyopia in an adult population. *Ophthalmology*. 1998;105(1):154–159.
5. Simons K. Amblyopia characterization, treatment, and prophylaxis. *Surv Ophthalmol*. 2005;50(2):123–166.
6. Webber AL, Wood J. Amblyopia: prevalence, natural history, and treatment outcomes. *Clin Exp Optom*. 2005;88(6):365–375.
7. Repka MX, Kraker RT, Beck RW, et al. Treatment of severe amblyopia with patching. *Ophthalmology*. 2003;110(11):2075–2087.
8. Pediatric Eye Disease Investigator Group (PEDIG). A randomized trial of atropine vs patching for amblyopia. *Arch Ophthalmol*. 2002;120(3):268–278.
9. Dandona R, Dandona L. Childhood blindness in India: causes and prevention. *Curr Opin Ophthalmol*. 2007;18(5):345–350.
10. Newsham D. Parental non-concordance with occlusion therapy. *Br J Ophthalmol*. 2000;84(9):957–962.
11. American Academy of Ophthalmology. Preferred Practice Pattern: Amblyopia. San Francisco: AAO; 2017.
12. Daniel WW. *Biostatistics: A Foundation for Analysis in the Health Sciences*. 9th ed. New York: Wiley; 2009.
13. Holmes JM, Beck RW, Repka MX, et al. Risk factors for amblyopia. *Ophthalmology*. 2003;110(11):2097–2104.
14. Pediatric Eye Disease Investigator Group (PEDIG). The clinical profile of amblyopia in children. *Arch Ophthalmol*. 2002;120(3):281–287.
15. Attebo K, Mitchell P, Smith W. Risk factors for amblyopia in children. *Ophthalmology*. 1998;105(1):154–159.
16. Repka MX, Wallace DK, Beck RW, et al. Two-year follow-up of amblyopia treatment. *Ophthalmology*. 2005;112(11):2082–2088.
17. Pediatric Eye Disease Investigator Group (PEDIG). Randomized trial of atropine vs patching. *Arch Ophthalmol*. 2002;120(3):268–278.
18. Cotter SA, Foster NC, Holmes JM, et al. Optical treatment of amblyopia. *Ophthalmology*. 2006;113(6):895–903.
19. Newsham D. Compliance with amblyopia therapy. *Eye (Lond)*. 2001;15(1):34–37.
20. Stewart CE, Stephens DA, Fielder AR. Factors influencing visual outcome in amblyopia. *Br J Ophthalmol*. 2005;89(12):1558–1561.