



SCREENING AND EVALUATION OF CASES OF AMBLYOPIA IN A TERTIARY EYE CARE CENTRE IN WESTERN UP

Ophthalmology

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ABSTRACT

Aim: To screen and evaluate the cases of amblyopia in tertiary eye care centre in western UP, India.

Material and Method: The present prospective observational study was conducted in the Department of Ophthalmology at Chatrapati Shivaji Subharti Hospital from December 2018 to November 2019. Eye examination was done using Binocular Red Reflex (Brückner) and Binocularity/Stereoacuity Testing. Visual acuity was tested at distance (10 to 20 feet or 3 to 6 meters) and at near (14 to 16 inches or 35 to 40 centimeters). For each patient, amblyopia was classified as refractive, strabismic or deprivation amblyopia based on a set diagnostic parameters.

Results: Prevalence of amblyopia was 2.43% in our study. Maximum cases of amblyopia (46.03%) were diagnosed as Refractive amblyopia followed by strabismic amblyopia (39.68%) and deprivation amblyopia (14.29%). Binocular vision was absent in 19 (30.15%) subjects while 44 (69.85%) subjects had some grade of binocular vision.

Conclusion: Based on our results, we do recommend obligatory regular screening of school children and young adults using simple distance VA chart by well-trained health care providers.

KEYWORDS

Amblyopia, Prevalence, Prevention

INTRODUCTION:

Amblyopia is maldevelopment of the visual cortex in the brain during infancy or early childhood that leads to decreased central vision in the affected eye. Any abnormality that leads to irregular visual stimulation can cause amblyopia, including strabismus, refractive error or sensory visual deprivation. Amblyopia causes more unilateral cases of reduced vision in childhood than all other causes combined, and it affects approximately 2-5% of all children^{1,2}.

The pathology of amblyopia generally occurs by one of two mechanisms. First, a blurred or incomplete image on the retina during the period of visual development (from birth until approximately 10 years of age) inhibits cortical activity in the brain, ultimately leading to underdevelopment of vision in the affected eye. Second, in the setting of strabismus, misaligned eyes prevent the child from developing fusion of the images from each eye, which leads the brain to suppress the image from the deviated eye so as to avoid diplopia, which in turn reduces the visual potential of that eye³. Amblyopia can lead to permanent loss of vision if timely corrective measures are not taken.

Previous estimates of the prevalence of amblyopia have ranged from 0.2% to 5.3% of the population. Rates have varied with the visual acuity criterion used and the age group of the population sampled. Most previous studies suffer from selection bias, because they have included clinic groups, preschool or school population samples with low response rates, or military populations. Eye clinic populations may overestimate amblyopia prevalence because only persons with referred or self-selected eye problems are included^{4,5}.

However, there have been limited studies elucidating the prevalence, cause, and magnitude of amblyopia; and less emphasis is given to amblyopia in the tertiary eye hospitals, with more attention toward cataracts and other ocular morbidities. In our study we enrolled cases with no selection bias, including both children and adult so as to screen and evaluate the cases of amblyopia in tertiary eye care centre in western UP, India.

MATERIAL AND METHODS:

The present prospective observational study was conducted in the department of Ophthalmology at Chatrapati Shivaji Subharti Hospital from December 2018 to November 2019. Patients were enrolled in the study after obtaining written informed consent and approval from Institutional Ethical Committee. Patients of either sex and of age 0-40 years diagnosed as amblyopia were included in the study. Patients having any abnormality in anterior and posterior segment, history of strabismus surgery, history of trauma to eye and any pathology in neural pathway were excluded from the study.

Diagnostic criteria used for analysis of amblyopia are presented in table 1.

Table 1: Diagnostic criteria for amblyopia

Assessment	Finding
Unilateral Amblyopia	
Response to monocular occlusion	Asymmetric Objection
Fixation Preference	Failure to initiate or maintain fixation
Preferential looking	Interocular difference* of two or more octaves
Best corrected visual acuity	Interocular difference of two or more lines
Bilateral Amblyopia	
Best corrected visual acuity	Age 3 to ≤4 years: Visual acuity worse than 6/18 Age 4 to ≤5 years: Visual acuity worse than 6/12 Age >5 years: Visual acuity worse than 6/9

*A 2-octave difference is a 4-card difference in the full set of Teller Acuity Cards

Demographic data, including sex, date of birth, and identity of parent/caregiver were recorded. The chief complaint and reason for the eye evaluation viz. current eye problems, ocular history, including prior eye problems, diseases, diagnoses, and treatments was noted. Family history of ocular conditions and relevant systemic conditions was also recorded.

Eye examination was done using Binocular Red Reflex (Brückner) and Binocularity/Stereoacuity Testing. Visual acuity is routinely tested at distance (10 to 20 feet or 3 to 6 meters) and at near (14 to 16 inches or 35 to 40 centimeters).

Determination of refractive errors is important in the diagnosis and treatment of amblyopia or strabismus. Patients underwent cycloplegic refraction with retinoscopy, followed by subjective refinement when possible. Adequate cycloplegia is necessary for accurate retinoscopy in children because of their increased accommodative tone compared with adults.

The optic disc, macula, retina, vessels, and the choroid were examined, using an indirect ophthalmoscope and condensing lens after adequate dilation is achieved.

For each patient, amblyopia was classified as refractive, strabismic or deprivation amblyopia⁶. The diagnosis of refractive amblyopia was

Diagnostic Criteria:

made when hypermetropia was >4.00 D, myopia >6.00 D, and astigmatism >2.50 D with no related strabismus or ocular pathology. Strabismic amblyopia was defined as amblyopia in the presence of heterotropia at a distance and in the absence of refractive error meeting the criteria for aniso-strabismic amblyopia⁷. In our study, we defined aniso-strabismic amblyopia as amblyopia associated with either a heterotropia at a distance and/or near fixation and anisometropia, 1.00 D or more in spherical equivalent.

STATISTICAL ANALYSIS:

Data so collected was tabulated in an excel sheet and analysed using SPSS version 24.00 for windows (SPSS inc, Chicago, USA). Difference between two groups was determined using chi square test and the level of significance was set at $p < 0.05$.

OBSERVATION AND RESULTS:

Table 1: Prevalence of amblyopia

Variables	N	%
Total Screened	2589	100
Amblyopia Present	63	2.43

Out of 2589 patients screened, 63 cases were diagnosed with amblyopia. Therefore the prevalence of amblyopia was 2.43% in our study (table 1). Number of male subjects and female subjects in our study were 34 (53.97%) and 29 (46.03%) respectively.

Table 2: Age and gender distribution of the amblyopic subjects

Age Group (in years)	Unilateral		Bilateral		Total	
	N	%	N	%	N	%
<4	6	85.70	1	14.30	7	11.11
4-10	28	96.56	1	3.44	29	46.03
11-20	18	100	0	0	18	28.57
>20	9	100	0	0	9	14.28
Total	61	96.82	2	3.18	63	100
Chi Square	2.79					
p value	0.18					
	Male		Female		p value	
	N	%	N	%		
Unilateral	33	97.06	28	96.55	0.28	
Bilateral	1	2.94	1	3.45		
Total	34	100	29	100		

Maximum cases of amblyopia i.e. 29 (46.03%) were diagnosed in 4-10 years followed by 18 cases (28.57%) in 11-20 years age group. Minimum cases of amblyopia i.e. 7 (11.11%) were diagnosed in <4-year age group. Number of male and female subjects in our study were 34 (53.97%) and 2 (46.03%) respectively. Amblyopia was unilateral in 96.82 % of the subjects and bilateral in 3.18% of the subjects. When unilateral and bilateral amblyopia was compared according to different age group and gender distribution, it was found to be statistically insignificant as $p > 0.05$ (table 2).

Table 3: Distribution of different types of refractive, strabismic and amblyopia

Refractive Amblyopia		N=29	%
Hypermetropia		13	44.83
Myopia		3	10.35
Anisometropia		8	27.58
Astigmatism		5	17.24
Strabismic Amblyopia		N=25	%
Esotropia		16	64
Exotropia		8	32
Vertical deviation		1	4
Deprivation Amblyopia		N=9	%
Congenital Cataract		4	44.45
Ptosis		2	22.22
Retinoblastoma		1	11.11
Corneal Opacity		2	22.22

Maximum cases of amblyopia i.e. 29 (46.03%) were diagnosed as Refractive amblyopia. Minimum cases of amblyopia i.e. 9 (14.29%) were diagnosed as Deprivation amblyopia (Graph 2). Maximum cases of refractive amblyopia were seen in hypermetropes i.e. 13 subjects (44.83%) followed by anisometropes i.e. 8 subjects (27.58%). Astigmatism was seen in 5 subjects (17.24%). Maximum cases of strabismic amblyopia were diagnosed as esotropia in 16 (64%) subjects

followed by exotropia in 8 subjects (32%) Congenital cataract was the most common cause of deprivation amblyopia in 4 subjects (44.45%) followed by ptosis and corneal opacity in 2 subjects each (22.22%) (Table 3).

Table 4: Distribution of refractive status in the amblyopic eye of the subjects

	Hypermetropia		Myopia		Anisometropia		Emmetropia	
	N	%	N	%	N	%	N	%
Refractive Amblyopia	13	44.82	3	10.34	13	44.82	0	0
Strabismic Amblyopia	12	48	3	12	7	28	3	12
Deprivation Amblyopia	2	22.22	2	22.22	3	33.33	2	22.22
Total	27	42.86	8	12.70	23	36.50	5	7.94

Overall Hypermetropia was found to be the most common refractive error in 27 subjects (42.86%) followed by anisometropia in 23 subjects (36.50%). Myopia was found in 8 subjects (12.70%) (Table 4). There was no significant co-relation present between the refractive status of the eye and the type of amblyopia.

Table 5: Distribution of binocularity status of the amblyopic subjects

	Binocular Vision Absent		Binocular Vision Present	
	N	%	N	%
Refractive Amblyopia	5	17.24	24	82.76
Strabismic Amblyopia	7	28	18	72
Deprivation Amblyopia	7	77.77	2	22.23
Total	19	30.15	44	69.85

Binocular vision was absent in 19 (30.15%) subjects while 44 (69.85%) subjects had some grade of binocular vision (Table 5).

DISCUSSION:

Early detection of amblyopia is important for effective treatment and restoring visual acuity at an early age. Recent evidences on successful treatment of amblyopia in children up to 12 years old have encouraged for more screening programs for older children also. This helps discovering undiagnosed amblyopes who have been missed in earlier screening programs or those living in countries with poor medical services and no screening programs⁸. Although the global prevalence of amblyopia is 1.6–3.6%⁹, the available data concerning the prevalence of amblyopia in different geographical areas is still inadequate. There have, however, been limited studies where amblyopia has been the primary focus of attention with the establishment of the patient profile, age of presentation, and other demographic details. Therefore the present study was constructed to screen and evaluate the cases of amblyopia.

In our study 2589 patients were screened in the study period out of which 63 cases were diagnosed with amblyopia. Therefore the prevalence of amblyopia was 2.43% in our study. The prevalence of amblyopia in our study is consistent with global results of 1.6–3.6%. Damaris Magdalene et al¹⁰ in their study revealed that the prevalence of amblyopia was 1.75% which is also consistent with our study.

Amblyopia was unilateral in 96.82% and bilateral in 3.18% of the subjects in our study. Vimla Menon et al¹¹ in their study found similar distribution of unilateral and bilateral amblyopia.

In our study maximum cases of amblyopia i.e. 29 (46.03%) were diagnosed in 4-10 years of age group. Vimla Menon et al¹¹ in their study revealed similar results too i.e. majority of patients presented between the ages of 4 and 10 years. Probable reason for such an occurrence can be due to the fact that most of the cases falling in this age group are school going and have more chances of being diagnosed with amblyopia due to reading difficulties.

Out of the 63 amblyopic subjects in our study maximum cases i.e. 29 (46.03%) were diagnosed as refractive amblyopia followed by strabismic amblyopia in 25 (39.68%) subjects and deprivation amblyopia in 9 (14.29%) subjects. In a study by Damaris Magdalene et al¹⁰, 45.29% had refractive amblyopia, 40.36% had deprivation amblyopia and 14.35% had strabismic amblyopia with incidence of refractive amblyopia consistent to our study while deprivation amblyopia was found to be more than strabismic amblyopia which is

inconsistent to our study. Also in contrast to our study, Menon V et al¹¹ found strabismus to be the most prevalent cause of amblyopia (62.22%). This could be because their study was conducted at squint and amblyopia clinic of the hospital where children with strabismus, that is, exotropia, esotropia, etc., tend to come more frequently than simple refractive errors whereas our study population comprised of all cases attending Ophthalmology OPD upto 40 years of age irrespective of their underlying pathology.

Overall, in different types of amblyopia, hypermetropia was found to be the most common refractive error in 27 subjects (42.86%) followed by anisometropia in 23 subjects (36.50%). Myopia was found in 8 subjects (12.70%) and 5 subjects (7.94%) had no underlying refractive error. There was no significant co-relation present between the refractive status of the eye and the type of amblyopia in our study. According to a study by Vimla Menon et al¹¹, there was no significant co-relation present between the refractive status of the eye and the type of amblyopia, which is similar to our study. These results are in accordance with study done by Valeria Mocanu et al¹² who reported that while analyzing the values of the refractive errors, a statistically significant difference for hypemetropia and astigmatism was found. These refractive errors were also identified as risk factors for amblyopia in the general population. In the Australian preschool children study, hyperopia was identified in 66.7% of the amblyopic preschool children and myopia was present in 7.4% of the children which is similar to results in our study, however incidence of anisometropia and astigmatism was inconsistent to our study¹³.

Congenital cataract was the most common cause of deprivation amblyopia followed by ptosis as well as corneal opacity in our study. Binocular vision was absent in 19 (30.15%) subjects while 44 (69.85%) subjects had some grade of binocular vision in our study. Similar results were found by Damaris Magdalene et al¹⁰ and Vimla Menon et al respectively in their study¹¹.

In our study, we enrolled cases with no selection bias, thus our study included both children and adult population unlike many studies which either were done on children or on adult population. This served as an advantage to our study. However limitations to our study were small sample size and a relatively shorter duration of study period (1 year). Population-based studies at a future date with no selection bias, larger sample size and longer duration period would thus be useful to further validate the mass education measures that can be taken up to prevent and treat this condition.

CONCLUSION:

Early detection of amblyopia and institution of appropriate therapy is of immense value towards preventing the prevalence of life long visual morbidity. Therefore, the most important benefit from screening is the reduction of preventable visual loss. Based on our results, we do recommend obligatory regular screening of school children and young adults using simple distance VA chart by well-trained health care providers. Referral for consultation is mandatory if patients are having VA of 6/18 or worse in one or both eyes which cannot be adequately corrected by use of glasses. We hope this would help over the lack of awareness among parents and community and promote better quality of life.

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