



Etiology and Prevalence of Amblyopia in Eastern India

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Abstract

Background: Amblyopia is when vision in one or both eyes does not develop properly during childhood. It is sometimes called lazy eye. Amblyopia is a common problem in babies and young children.

Material and Methods: A total of 5050 school children aged between 5 and 15 years were screened in a population based cross sectional study.

Result: Out of 5000 patients, 50 were lost to follow up. Eventually our sample size reduced to 5000 patients.

Conclusion: In this study, the prevalence of amblyopia was 1.1% of the school children. Ametropia and anisometropia were the most common causes of amblyopia. We did not face any significant difference in amblyopia prevalence between rural and urban school children.

Keywords: Amblyopia, cross-sectional study, school children.

Introduction

Amblyopia is a unilateral or, less commonly, bilateral reduction of best-corrected visual acuity (also referred to as corrected distance visual acuity) that cannot be attributed directly to the effect of any structural abnormality of the eye or visual pathways. Amblyopia signifies a failure of normal neural development in the immature visual system and is caused by abnormal visual experience early in life resulting from strabismus, refractive error such as anisometropia or high bilateral refractive errors (isometropia) and visual deprivation. Amblyopia is sometimes called lazy eye. Amblyopia is a common problem in babies and young children. Refractive error is one of the common causes of amblyopia^[1-3]. A child's vision develops in the first few years of life. It is important to diagnose and treat amblyopia as early as possible. Otherwise, a child with

amblyopia will not develop a normal or healthy vision. It is the most common cause of unilateral visual impairment in adults younger than 60 years. The prevalence of amblyopia is increased in children with a family history of amblyopia, children born prematurely, and those with developmental delay.

Aims & Objectives

To determine the etiology and prevalence of amblyopia in school children in Eastern India.

Materials & Methods

Methods: A total of 5050 school children aged between 5 and 15 years were screened in a population-based, cross-sectional study at the Out Patient Department of Ophthalmology of M.G.M Medical College and Kishanganj, Bihar from January 2015 to December 2016.

All children had undergone detailed history related to age of the onset, as noticed by the patient or his guardian. Ophthalmic examination included visual acuity by Snellen vision chart, cycloplegic refraction by streak retinoscope, auto-refractometer, thorough anterior and posterior segment examination by slit lamp biomicroscopy and assessment of ocular alignment by cover-uncover test and ocular motility. Assessment of binocular status of the eye was performed with the help of Worth's four-dot test and synaptophore.

An **inclusion criterion** was best corrected visual acuity in one or both eye 6/12 or less than 6/12 in absence of any organic lesion according to ATS. Cases of trauma, previous history of ocular surgery and diseases affecting the vision were excluded from the study. All the tests were performed under the observation of the main investigator.

The criteria used for each subtype and diagnosis were

Amblyopia associated with degraded visual input due to high refractive error was labelled ametropic amblyopia. Anisometric amblyopia was diagnosed in participants with interocular refractive error difference ≥ 1 dioptre. Strabismic amblyopia included that due to conflicting visual inputs between the eyes due to squint. Stimulus deprivation amblyopia was defined as amblyopia due to obstruction of visual axis. Anisometric amblyopia is caused by a difference in refractive error between the eyes and may result from a difference of as little as 1 dioptre. The more ametropic eye receives a blurred image, in a mild form of visual deprivation. It is frequently associated with microstrabismus and may coexist with strabismic amblyopia. Strabismic amblyopia results from abnormal binocular interaction where there is continued monocular suppression of the deviating eye. Stimulus deprivation amblyopia results from vision deprivation. It may be unilateral or bilateral and is typically caused by opacities in the media (e.g cataract) or ptosis that covers the pupil. Meridional amblyopia results from image blur in one meridian. It can be unilateral or bilateral and is caused by uncorrected astigmatism (usually

>1D) persisting beyond the period of emmetropization in early childhood. Bilateral ametropic amblyopia results from high symmetrical refractive errors, usually hypermetropia.

Results

The prevalence of amblyopia in our study was found to be 1.1% (n=54) [Table 1/Fig1]. Our study showed that the number of boys with amblyopia was 56% which was higher than number of girls with amblyopia 44% as shown in the [Table2/ Fig 2]. The results showed a total of 64.7% had mild to moderate amblyopia and 35.3% suffered from severe amblyopia.

Underlying amblyogenic causes were ametropia (50%), anisometropia (38%), strabismus (6.5%), visual deprivation (3.7%) and combined causes (1.8%). No statistically significant difference was noted in the prevalence of amblyopia between rural (1.3%) and urban (0.8%) children (p=0.5) [Table3/ Fig3]. Age of presentation of amblyopia for 5 to 10 year-old age group was 51.85% and for 10 to 15 year-old age group was 48.14% (p=-value >0.05) [Table4/Fig4]. Binocular amblyopia (57.40 %) was more than unilateral amblyopia (42.59 %) [Table5/Fig5]

[Table 1] Percentage of amblyopia in our study

Total cases (n=5000)	Amblyopia
4946	No
54	Yes

[Table2] Gender distribution in our study

Total cases(n=5000)	Amblyopia (n=54) (100%)
Male(n=3000)	30(56%)
Female(n=2000)	24(44%)

[Table3] Distribution of type of amblyopia

SL. No.	Causes of Amblyopia	No. of Amblyopia	Percentage
1.	Ametropia	27	50%
2.	Anisometropia	21	38%
3.	Strabismus	3	6.5%
4.	Visual deprivation	2	3.7%
5.	Combined	1	1.8%

[Table4] Age of presentation of amblyopia

Age Group	No. of Cases	Percentage	Male/Female Ratio
5-10 Years	28	51.85%	17/11
10-15Years	26	48.14%	13/13

[Table5]

	No. of Amblyopia	Percentage
Monocular	23	42.59%
Binocular	31	57.40%
Total	54	100%

Discussion

Prevalence of amblyopia varies because of different age-group of studied populations and different factors prevailing in that region, like literacy rate, frequency of visual screening programmes and geographical factors. The population based regional studies in India related to childhood blindness and prevalence of refractive errors showed prevalence rate of amblyopia to be 1.1% (V Kaliliyavi et al.,)^[11]. This study showed similarity with our study. In another study by Rahi et al., involving nine states in our country, cataract, uncorrected aphakia and amblyopia comprised of 12.3% severe visual impairment^[4]. In the urban population, the study reported the prevalence rate of amblyopia to be about 4.4% (GV Murthy et al.,)^[5]. In a study done in Andhra Pradesh in India, the prevalence of amblyopia was 6.6% (K Anjaneyulu et al.,)^[6]. In South-Asian region the Chinese studies showed prevalence rate which varies between 0.8% to 2.5% in different subsets of population done by (Andrey Chia et al., and Jing Fu et al.,) respectively^[7,8]. In Nepalese hospital based study the prevalence was 1%^[9]. Another hospital based study done in Bharatpur, Nepal, the prevalence rate was 1.40% (Gopal Bhandari et al.,)^[10]. In our study, the percentage of Amblyopia was 1.1%, which is lower as compared to past studies.^[4,5,6]. In a study based in New Delhi, refractive error was the cause in 81.7% of eyes with vision impairment, amblyopia in 4.4%, retinal disorders in 4.7%, other causes in 3.3%, and unexplained causes in the remaining 5.9%^[11]. It may be due to low literacy rate in the rural population, lower paediatric referrals from peripheral health centres and from visual screening

programmes in schools. In our study, we found gender preference, where the male amblyopia was 51.85% and female was 48.14% but the p-value was insignificant ($p > 0.05$). Similar finding was found in study done in Nepal which is demographically very similar to our study region (K Sapkota et al.,)^[9]. An explanation for this gender discrepancy may be due to the bias that fewer girls report, as compared to boys in our hospital-based setting. Same gender preference was found in a study done by Lee et al.,^[13]. But the opposite was found in a study by K Anjaneyulu et al., and Park et al.,^[12,14].

In our study, bilateral amblyopia was higher (57.40%) than unilateral amblyopia (42.59%), which is uncommon and opposite to the study done in Nepal (71% unilateral amblyopia)^[9], in Andhra Pradesh by K Anjaneyulu et al.,^[3] and by Menon et al., where 7% cases were bilateral^[15]. Our study however had findings consistent with study of Chung et al., where (49%) amblyopia was bilateral^[16].

In our study, the most common cause of amblyopia was due to ametropia (50%), followed by anisometropia (38%), strabismus (6.5%), visual deprivation (3.7%) and combined causes was least common (1.8%). In this study, anisometric amblyopia was the most common type of amblyopia^[9]. A Nepalese study showed dissimilar findings where amblyopia due to astigmatism was most common (59.2%) followed by hypermetropia (33.5%). In Indian study done by Menon et al., amblyopia due to hypermetropia was highest (51.65%). Anisometric amblyopia was second most common (22.1%) after strabismus amblyopia (37.38%), followed by ametropic amblyopia 12.88%, and meridional amblyopia was 5.56%^[15].

In our study, the age of presentation of amblyopia in 5-10 years age group was more for male cases (60.71%) and less for female cases (39.28%). In the 10-15 years age group there was no difference in the percentage of amblyopia cases among male and female (50%). Our findings were slightly different from a study by K Sapkota et al., where male/female ratio was 44/20 for younger age group and 15/19 for older age group^[9].

Anisometropic amblyopia is the most common cause of amblyopia in our and another study^[20]. The reason for development of amblyopia in anisometropia is a chronically blurred image in one or both eye prevents the normal development of visual acuity. Even if anisometropia is optically corrected, anisokenia may be another amblyogenic factor for development of amblyopia^[17]. Severity and prevalence of amblyopia increases as the amount of anisometropia increases^[18,19].

Hypermetropic patients with anisometropia of one Diopter difference may have amblyopia, while myopic anisometropic usually do not have amblyopia until anisometropia is large^[20]. Unilateral high hyperopia or myopia greater than 6 Dioptre can cause severe amblyopia^[21,22].

In Vision 2020, amblyopia is a major preventable and treatable cause of low vision among paediatric age group^[23-25]. If left untreated, paediatric amblyopia may result in monocular and binocular low vision^[5,26-28,29-31] with associated deterioration in Quality of Life indices in adulthood. Therefore measures for early detection and dedicated rehabilitation of amblyopia should be a priority and also should be evidence-based. This should be the hallmark of the blindness control programme in India^[24,25].

Conclusion

The conclusions reached in this study are: In this study, the prevalence of amblyopia was 1.1% of the school children. Ametropia and anisometropia were the most common causes of amblyopia. We did not face any significant difference in amblyopia prevalence between rural and urban school children. We found in our study that refractive error is the major common cause of amblyopia and if it is not corrected timely, can cause not only permanent visual morbidity but also economical and psychological problem in adult life by not pursuing certain occupation because of lack of binocular vision. The results of our study emphasizes the need for more screening and public awareness programmes for prescribing the correct spectacles and educating the parents to help their children to

use them (if needed).

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