

Prevalence of various types of amblyopia in different age groups

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Abstract

Objective: To find out the prevalence of various types of amblyopia in patients of different age groups.

Study design: It is a descriptive cross sectional hospital based study.

Place and duration of study: A Six-month study was carried out in Department of Ophthalmology, Eye OPD, Holy Family Hospital, Rawalpindi . (from April 2022 till September 2022)

Material and Methods: Fifty patients were studied for the research purpose. Detailed examinations were performed including history taking, slit lamp examination, vision and refraction and fundoscopy. Orthoptic assessment was done on patients presented with the complaint of deviation. Patients who were performed with cycloplegic refraction were called on a follow up for the post mydriatic test (PMT).

Results: Out of the 50 amblyopic patients presented in the refraction room, ametropic amblyopia was seen as the most frequent type of amblyopia. As per data, 22 out of 50 patients had ametropic amblyopia. Meridional amblyopia came out to be the second most frequent type with 13 patients followed by anisometropic amblyopia that had 8 patients. 5 of the patients had strabismic amblyopia and 2 were presented with deprivation amblyopia.

Conclusion: Ametropic amblyopia is the most common type of amblyopia. It is more frequently seen in males than females. Although amblyopia develops in early childhood, the age group in which ametropic amblyopia is frequently presented in the eye OPD is 11-16 years of age and then 5-10 years of age.

Keywords: Amblyopia, anisometropic amblyopia, ametropic amblyopia, deprivation amblyopia, meridional amblyopia, strabismic amblyopia, patching therapy.

1. Introduction

Amblyopia is the term used to describe a unilateral or bilateral decrease in best corrected visual acuity that is not directly related to an abnormality of the eye's structure or the posterior visual pathways. On a physical examination of the eye, no obvious cause is found.¹ In other words, when binocular vision is compromised in early childhood, amblyopia generally develops as a neurodevelopmental disorder of the visual cortex. On the basis of visual acuity, this is easily diagnosable. The mechanism to see one image by the both eyes simultaneously is called Binocular single vision. There are certain levels of binocular vision. 1- Simultaneous perception (when a person perceives an image with his both eyes simultaneously) 2- Fusion (when two retinal images in cortex fuse to give the perception of single image) 3-Stereopsis (after the fusion of retinal images there is a slight horizontal difference that makes the perception of depth).²

When specific retinal areas are activated simultaneously, the sensation of single vision is created. These areas are corresponding retinal areas. When corresponding points of both the retinas lie in the same position with respect to fovea, this is referred to as normal retinal correspondence.³ Visual confusion arises when dissimilar images stimulate the corresponding retinal sites. It seems as though images are stacked on top of one another. Diplopia occurs, when non-corresponding retinal sites are activated.⁴ The cortex ignores the image of one eye and only uses the healthy eye to produce images on the retina in order to prevent confusion and diplopia. This process is termed as Suppression.⁵ Amblyopia may result from monocular suppression. Thus, amblyopia is a condition of diminished visual form sense that is not brought on by any clinically evident aberration of the visual pathway and is not alleviated by the removal of any defect that creates a dioptric barrier to the development of the foveal image.⁶

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There are additional elements that affect the development process and create amblyopia, as there is no underlying abnormality in the eye that affects the normal development of vision after birth. Refractive errors, strabismus, and occasionally any media opacification such as a cataract that prevents light from reaching the retina are among these causes.⁷ Strabismus impairs the development of binocular single vision.

The most prevalent kinds of amblyopia are strabismic amblyopia, refractive amblyopia and deprivation amblyopia. Refractive amblyopia includes anisometropic, ametropic, meridional and bilateral amblyopia.

When the refractive error is larger in one eye than the other, it's known as anisometropic amblyopia. The brain "turns off" the eye that is more farsighted in favor of the eye that produces a sharper image. As little as a 1D change in refractive error between the two eyes can cause anisometropic amblyopia.⁸ Refractive amblyopia may not be detected until the child undergoes a vision examination.

A squint develops in strabismic amblyopia as a result of an imbalance between the muscles supporting the position of the eyes. The brain mostly uses the images produced by the stronger eye and "ignores" the eye that is not straight.

Deprivation amblyopia is a condition in which one eye is "deprived" of sight as a result of the formation of a cataract or a ptosis that covers the pupil. Reverse amblyopia or occlusion amblyopia, is brought on by excessive patching for therapeutic reasons.⁹

A significant amount of bilaterally uncorrected refractive error, typically hypermetropia, results in ametropic amblyopia.¹⁰ Meridional amblyopia, which can be unilateral or bilateral, is brought on by uncorrected astigmatism that lasts past the point of emmetropization in early childhood and is typically >1D.¹¹

To prevent amblyopia, early detection and therapy are crucial. Vision screening is advised in children between three and five years of age at least once to check for the possibility of amblyopia or its risk factors.¹² When reading single letters as opposed to letters in a row, amblyopia sufferers typically have superior visual

acuity. While this "crowding" phenomenon happens in normal individuals to some degree, it is more noticeable in amblyopes.¹³ For the purpose of diagnosing amblyopia, a linear test type is therefore preferable. Pinhole testing is performed if visual acuity is not 20/20. Refractive error alone is present if vision becomes 20/20 with a pinhole; if not, amblyopia needs to be taken into account.

Since amblyopia typically does not occur beyond the ages of 6 to 8, it is possible that there is a "sensitive period" during which it develops. It can be inferred from the sensitive time for amblyopia development that there is a sensitive phase for its therapy. Clinical treatment was therefore frequently restricted to young children. But according to new research, older youngsters (ages 13 to 17) who have never received treatment before may benefit from it.¹⁴

Patching therapy or occlusion therapy has proved to be the most beneficial treatment option for amblyopia. The best course of action is to occlude the normal eye in order to promote the usage of amblyopic eye. It is a frequently employed method in which an adhesive patch (opticlude or coverlet) is applied to the good eye.¹⁵ The patch can be worn for a customizable amount of time. Occlusion has a dose-response effect that is linear, and the results of a dosage of two hours per day are comparable to longer-term therapy.

Other treatment options include atropine penalization, refractive correction, surgical treatment for strabismic and deprivation amblyopia, additional techniques like cloth for patching of glasses, opaque contact lenses and adjusting the prescription for blurring of vision in better eye.¹⁶

An investigation into the global prevalence of amblyopia in children was conducted in 2020 by the Romanian Journal of Ophthalmology. 131 studies were found among the 952 collected citations. Amblyopia affects 4.3% of children worldwide, according to mathematical estimates. According to the subgroup analysis, the majority of children worldwide had the highest prevalence of amblyopia (5.57%, 95% CI: 2.23%-13.94%, P-value 0.0001) in America and the lowest prevalence (7.1%, 95% CI: 0.003%-172.53%, P-value 0.05) in Africa. The overall prevalence of amblyopia was estimated to be 3.4%. However, estimates vary across all continents, particularly in Africa.¹⁷

A study conducted at Jaipuriya Hospital in Jaipur to identify the various forms of amblyopia in kids between the ages of 5 and 15. 44 of the 4020 kids overall had an amblyopia diagnosis. Anisometric amblyopia (29.5%), strabismic amblyopia (25%) meridional amblyopia (13.6%), ametropic amblyopia (11.6%), and the least common kind of amblyopia, which was caused by visual deprivation (4.5%), were the types of amblyopia that were diagnosed.¹⁸ The frequency of these types of amblyopia may vary depending on the regional differences and sample size.

2. Materials & Methods

Descriptive cross-sectional hospital based study was conducted within the duration of six months. Out of 2500 patients presented in the eye OPD, Holy Family Hospital, Rawalpindi, 926 were referred to the refraction room. Taking into account the study duration, 50 patients with amblyopia were studied for research purpose. Data was collected through specifically designed proformas. History was taken and detailed eye examinations were performed including slit lamp examination, vision and refraction, orthoptic assessment and fundoscopy.

On the basis of inclusion criterion, patients of all age groups, both genders, patients with complaint of decreased vision and the ones with refractive errors and strabismus were included in the study.

Non-cooperative patients and patients with ocular pathologies were excluded on the basis of exclusion criterion.

3. Results

Results of my study showed that amblyopia has various types and the most common type seen within the given sample size is ametropic amblyopia. 22 out of 50 patients had ametropic amblyopia that makes it a total of 44%. 13 (26%) out of 50 had meridional amblyopia, 8 (16%) out of 50 had anisometric amblyopia, 5 (10%) out of 50 had strabismic amblyopia and only 2 (4%) out of those 50 patients had deprivation amblyopia. Out of these cases, 33 (66%) were males and 17 (34%) were females. Age based distribution showed that only 35% of the cases were presented in the age group 5-10 years whereas 65% of the cases were presented between 11-16 years of age. Gender based distribution showed that 12 (54%) out of the 22 ametropic amblyopia patients were

males and 10 (45%) were females. Similarly, 9 (69%) of the 13 patients with meridional amblyopia were males and 4 (31%) were females. Anisometric amblyopia had 6 (75%) males and 2 (25%) females out of the 8 cases presented. Strabismic amblyopia had 4 (80%) males and only 1 (20%) female out of the 5 presented cases while 100% of the cases with deprivation amblyopia were seen to be males.

The following table shows that the number of patients timely diagnosed with amblyopia were less than the ones diagnosed later.

Table 1: timely diagnosed patients with amblyopia

Timely Diagnosis	Frequency	Percent
Yes	19	38.0
No	31	62.0
Total	50	100.0

As amblyopia is a common cause of monocular vision loss, in my research unilateral amblyopia was seen to be more frequent than bilateral amblyopia.

4. Discussion

Amblyopia is the unilateral or bilateral decline in best corrected visual acuity resulting from aberrant binocular interaction or from vision deprivation for which there is no discernible pathology of the visual pathway or the eyes. The critical period for amblyopia development is 6 to 8 years of age. This also indicates a critical period for its management and treatment. However, recent studies suggest that cases presented later in life (13 to 17 years) also show compliance to amblyopia treatment.

The purpose of this study is to determine the various types of amblyopia, the age groups it is most commonly presented in and the most common type of amblyopia presented. The study began on 2nd of April 2022 and lasted on 30th of September 2022. Out of the 24,618 patients presented in the eye OPD of Holy Family Hospital, nearly 9000 patients were referred to the

refraction room. Depending on the time availability and the number of patients presented, a sample size of 50 patients with amblyopia was taken. The sample selection was done along with an inclusion and exclusion criterion. The inclusion criterion allowed patients of all age groups, patients of both the genders, patients with complaint of decreased vision and patients presented with refractive errors and strabismus. Non-cooperative patients and patients with ocular pathology were excluded as a part of the exclusion criterion.

The research was held over a period of 6 months. My study showed that ametropic amblyopia is the most common type of amblyopia presented. 22 out of 50 patients had ametropic amblyopia that makes it a total of 44%. 13 (26%) out of 50 had meridional amblyopia, 8 (16%) out of 50 had anisometropic amblyopia, 5 (10%) out of 50 had strabismic amblyopia and only 2 (4%) out of those 50 patients had deprivation amblyopia. Out of these cases, 33 (66%) were males and 17 (34%) were females. Age based distribution showed that only 35% of the cases were presented in the age group 5-10 years whereas 65% of the cases were presented between 11-16 years of age. Since amblyopia doesn't develop beyond the age of 8 years, a late presentation also indicates negligence on the part of patients and their parents. Gender based distribution showed that 12 (54%) out of the 22 ametropic amblyopia patients were males and 10 (45%) were females. Similarly, 9 (69%) of the 13 patients with meridional amblyopia were males and 4 (31%) were females. Anisometropic amblyopia had 6 (75%) males and 2 (25%) females out of the 8 cases presented. Strabismic amblyopia had 4 (80%) males and only 1 (20%) female out of the 5 presented cases while 100% of the cases with deprivation amblyopia were seen to be males. The results showed that ametropic amblyopia is the most common type of amblyopia, presented more commonly in males than females and reported more commonly in 11-16 years of age.

The limitations of my study are small sample size and a single study location. Larger sample size with more than one hospital could give better results.

Conclusion:

Types of amblyopia presented in the eye OPD, Holy Family Hospital, are ametropic amblyopia, meridional amblyopia, anisometropic amblyopia, strabismic amblyopia and deprivation amblyopia. Ametropic

amblyopia is seen to be the most common type, presented more commonly in males presented in the age group 11-16 years.

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Disclosure/Conflict of interest:

Authors declared no conflict of interest.

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