

Frequency of Amblyopia in Pediatric Age Group

Iqra Khan¹, Razaullah Khan¹, Muhammad Ajmal Chaudhary¹, Muhammad Younis Tahir², Sajjad Muhammad Haider¹, Salah ud Din Arbi¹

Department of Ophthalmology, Sheikh Zayed Medical College¹, Rahim Yar Khan, Quaid e Azam Medical College², Bahawalpur.

Abstract

Background: Poor visual acuity (VA) in amblyopic children affects their performance in school and in daily life resulting in a negative impact on the career with increased burden on the community. Amblyopia care programs requires data to plan strategies for increasing awareness, screening and education of the amblyopic patients and their parents about refractive error (RE) correction and patching.

Objective: To determine the frequency of amblyopia in pediatric age group.

Study type, settings & duration: A cross-sectional prospective study was carried out at eye outpatient department (OPD) of Sheikh Zayed Medical College, Rahim Yar Khan from May to November 2022.

Methodology: A total of 160 children were included in the study. The participants of both genders, between the ages of 6-13 years, presented with a complaint of decreased vision were included while the participants with organic ocular diseases were excluded. Detailed history and ophthalmic examination was carried out including VA recording, cycloplegic refraction and funduscopy. Amblyopia was diagnosed in children in which best corrected visual acuity (BCVA) was below normal.

Results: Mean age of our patients was 8.99 ± 1.64 years. Majority of these patients 106 (66.25%) were between the age of 6 to 9 years. Out of these 160 patients, 101 (63.13%) were male and 59 (36.87%) were females. Frequency of amblyopia was found in 09 (5.63%) patients.

Conclusion: This study concluded that there is high frequency of amblyopia in children between the ages of 06-13 years. So, this particular age group should be given special consideration for early and effective management of this disorder.

Key words: Amblyopia, children, screening, anisometropic.

Introduction

Amblyopia, also known as lazy eye, is unilateral and rarely bilateral problem in which best corrected visual acuity (BCVA) is below normal in the absence of any structural or pathological anomaly of eye or visual pathway during the amblyogenic period of visual development.¹ It can be a consequence of any of the conditions like anisometropia, bilateral isometropia, unilateral or bilateral astigmatism and continuous unilateral strabismus. Congenital cataracts, congenital ptosis,

corneal injuries or dystrophies may be less common, but they may also cause amblyopia. An active family history of strabismus, amblyopia or corneal opacities have increased risk of amblyopia in pediatric age group.² Amblyopia is a relatively common public health problem worldwide and is included in the Vision 2020 initiative^{3,4} too, affecting approximately 2-3% of children according to the studied population and the term used. Its prevalence, mostly due to a lack of knowledge and identification, is generally underestimated.⁵ Amblyopia is unilateral mostly, so parents or caregivers can't identify even serious cases. Amblyopia is most responsive to treatment started during the amblyogenic period, when plasticity of our cortical brain usually allows to reverse almost all of the visual acuity (VA) loss in the amblyopic eyes.⁶ The best treatment result is through screening programs, which measure mono-VA in children while young. Thus most of the vision loss due to amblyopia can be prevented or reversed with timely treatment.⁷

Amblyopia can cause strabismus and can be developed as a result of strabismus. About 50%

Corresponding Author:

Muhammad Ajmal Chaudhary

Department of Ophthalmology

Sheikh Zayed Medical College, Rahim Yar Khan.

Email: ajmal15571@hotmail.com

Received: 30 October 2023, **Accepted:** 15 January 2024,

Published: 31 January 2024

Authors Contribution

IK conceptualized the project. IK & RK did the data collection. MAC & MYT did the literature search. SMH performed the statistical analysis. Drafting, revision & writing of manuscript were done by MAC & SDA.

Copyright © 2023 The Author(s). This is an Open Access article under the CC BY-NC 4.0 license.

of strabismic children develop amblyopia.⁸ If not diagnosed early and appropriately treated, strabismic children can have reduced binocular potential, cosmetic problems, low self-confidence and impaired social interactions.⁹ All these factors have an adverse effect on their psychosocial and health related quality of life with decreased employment.⁹ Periodic screening of vision is crucial because most of the vision disorders can be managed once recognized, still early detection of visual disorders is considered amongst the most cost effective ophthalmic intervention globally.¹⁰

Vision is a basic human right for everyone and amblyopic children need more attention. Poor VA in amblyopic children affects their performance in school and in daily life resulting in a negative impact on the career with increased burden on the community. Amblyopia management is usually long and requires understanding, patience and firm commitment by ophthalmologist, parents and children. Need of the hour is to design and implement public health strategies for amblyopia screening and management at school level. The planning of amblyopia care programs requires data. Limited data on frequency of amblyopia is available in pediatric age group to plan strategies for increasing awareness, screening and education of the amblyopic patients and their parents about refractive error (RE) correction and patching. This study aimed to report the frequency of amblyopia in children visiting Sheikh Zayed Medical College, Rahim Yar Khan.

There is no previous data available in district Rahim Yar Khan about the frequency of amblyopia in pediatric population. This frequency based analysis will be useful for District Health Authority (DHA) of Rahim Yar Khan to prioritize the areas to arrange screening programs for early detection and timely intervention which can prevent the child from being permanently blind. An organized, precise and categorized estimation of frequency of amblyopia will be useful for health policy makers for further planning on screening, detection and intervention programs for children in Rahim Yar Khan and other cities of Pakistan in future.

Methodology

This cross-sectional prospective study included 160 children using non-probability consecutive sampling technique. We recruited 160 children as per inclusion criteria from eye outpatient department (OPD) of Sheikh Zayed Medical

College, Rahim Yar Khan from May to November 2022.

The children of both the genders, between the ages of 6-13 years, presented with a complaint of decreased vision were included while the participants with organic ocular diseases causing decreased vision such as retinitis pigmentosa, stargardt's disease, cone dystrophy, macular scar etc were excluded.

Informed consent from the parents/guardian was taken. Data was recorded by using a designed questionnaire including demographic data, presenting VA, BCVA, fundus examination and type of amblyopia. After taking detailed systemic and ophthalmic history, examination of anterior and posterior segments was carried out. Snellen's illiterate 'E' chart was used to record VA. Hirschberg test and cover/ uncover test were performed to diagnose strabismus. Slit Lamp examination and fundoscopy with direct and indirect ophthalmoscope were done to rule out any organic ocular disease. Cycloplegic refraction with 1% cyclopentolate hydrochloride eye drops was performed to find out any RE or astigmatism by using Retinoscope. Amblyopia was diagnosed as per operational definitions.

Unilateral amblyopia was defined as difference of ≥ 02 lines in BCVA, when VA is 6/9.5 in the worse eye having amblyogenic risk factors (ARF) such as anisometropia, recent or past squint and obstruction to visual axis. Bilateral amblyopia was defined as BCVA less than 6/12 bilaterally in the presence of ARF such as ametropia. Ametropic amblyopia was defined as large and approximately equal uncorrected RE in both eyes i.e., hyperopia ≥ 4.0 diopter (D), myopia ≥ 6.00 D or astigmatism ≥ 2.50 D. Anisometropia was defined as unequal RE in both eyes. The difference that can lead to anisometropic amblyopia was ≥ 1.00 D in hyperopia, ≥ 3.00 D in myopia, or ≥ 1.50 D in astigmatism.^{11,12}

Data was analyzed with the Statistical Package for Social Sciences version-20 (SPSS-20). The quantitative variable like age was presented in the form of mean $\pm$ SD, in case distribution was not normal median or mode were used. Qualitative variables like gender, amblyopia and its types were presented as frequencies and percentages. Data was stratified for the age, gender and type of amblyopia to deal with effect modifier. Post-stratification chi-square test was applied. Fisher Exact test was applied when frequency in any cell is ≤ 5 . p -value of ≤ 0.05 was considered significant.

The ethical approval was obtained from the institutional review board of Sheikh Zayed Medical College, Rahim Yar Khan through reference number 236/IRB/SZMC/SZH.

Results

Our study recruited 160 children with an age range of 06 to 13 years, mean age was 8.99 ± 1.64 years. Majority of these patients 106 (66.25%) were between the age of 06 to 09 years and 54 (33.75%) were between the age of 10 to 13 years. Male children were more 101 (63.13%) than females 59 (36.87%) with a male to female ratio of 1.7:1.

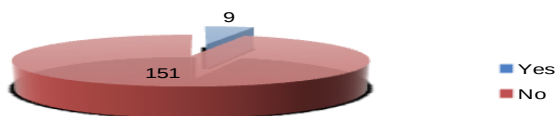


Figure: Frequency of amblyopia (n=160).

Table 1: Patient distribution with type of amblyopia. (n=9)

Type of Amblyopia	No. of Patients	%
Ametropic	01	11.11
Anisometropic	04	44.44
Strabismic	03	33.33
Sensory	01	11.11
Meridional	00	0.0

Table 2: Stratification of amblyopia with respect to age and gender.

	Amblyopia		p-value
	Yes	No	
Age (years)			
6-9	9 (8.49%)	97 (91.51%)	0.028
10-13	0 (0.0%)	54 (100.0%)	
Gender			
Male	4 (3.96%)	97 (96.04%)	0.232
Female	5 (8.47%)	54 (91.53%)	

Frequency of amblyopia in these children was found in 9 (5.63%) patients as shown in Figure. Distribution of patients according to type of amblyopia is shown in Table-1. The Table-2 showed the Age and gender based stratification of amblyopia.

Discussion

Amblyopia is considered as one of the most frequent¹³ and treatable¹⁴ cause of visual impairment in children, affecting about 1.6-3.6% of the pediatric population.^{1,14} About 2-3% of people in the United States have some degree of amblyopia.¹⁰

In 2015, the prevalence of visual disability in children between 03-05 years was 1.5%, or 174,600 individuals, which is expected to increase significantly in near future.¹⁵ Vision screening¹⁴ allows early diagnosis and treatment to prevent permanent visual disability and improved performance in academics with good quality of life.¹⁵

In Pakistan, 45% population comprises of children under the age of 15 years. It is assumed that the amblyopia prevalence in Pakistan is high as the exact magnitude of amblyopia in Pakistan is not known due to lack of reliable statistics.¹⁶ In Pakistan, few studies have been carried out on pediatric amblyopia. In a study conducted by Tariq et al.,² in Pakistan, frequency of amblyopia was 4.2% in which 29.41% had anisometropic amblyopia, 17.65% had ametropic amblyopia, 23.53% had meridional amblyopia, 17.65% had strabismic amblyopia and 11.76% patients had stimulus deprivation amblyopia. Frequency of amblyopia in this study was (35.3%) in 5-8 years age group, (47.1%) in 9-11 year age group and (17.6%) was in 12-15 year age group. Another study conducted in Pakistan by Alkhairy et al.,¹⁷ showed that 169 (6.7%) children were amblyopic and amblyopia was more prevalent in children less than 12 years of age i.e., 63 (37.3%). Males were 61 (36.1%) and females were 108 (63.9%). Malik et al.,¹⁸ from Pakistan showed results of 250 children, mean age was 5.00 ± 1.07 years, males were 132 (52.8%) and females were 118 (47.2%) and amblyopia was seen in 150 (60%) children.

In our study of 160 children, age range was 06-13 years with a mean age of 8.99 ± 1.64 years. Majority of these patients 106 (66.25%) were between the age of 6-9 years. Out of these 160 patients, 101 (63.13%) were male and 59 (36.87%) were female. Frequency of amblyopia in these children was found in 9 (5.63%) patients. Out of these 09 amblyopic children, 01 (11.11%) was ametropic, 4 (44.44%) were anisometropic, 3 (33.33%) were strabismic, and 1 (11.11%) was sensory.

In a study conducted in Iran, Rajavi Z et al. showed that amblyopia was present in 56 (2.3%) out of 2417 school going children between the ages of 7-12 years (mean age 9.4 ± 1.7 years) with no difference between the genders and anisometropia was one of the amblyogenic risk factors.¹⁹ Mocanu et al.,¹¹ identified amblyopia in 35 (2.8%) out of 1231 children, aged 5-16 years in an Eastern European population. Out of these 35 children with amblyopia, females were more 24 (68.8%) and there was statistically significant association between anisometropia and amblyopia.¹¹ Ikuomenisan et al., in their study of 1702 Nigerian

children showed that amblyopia was seen in 24 (1.41%) children, 90% of the children were 4-10 years of age and males were more 899 (52.8%) than females 803(47.2%) students.²⁰ A meta-analysis conducted by Fu Z et al. in 2019 (60 studies with 1859327 participants) showed that combined amblyopia prevalence was 1.44%. Prevalence of amblyopia in North America (2.41%) and Europe (2.90%) were higher than in Africa (0.72%) and Asia (1.09%). Prevalence was highest among participants having age more than 20 years (3.29%) with no difference in the prevalence between genders.²¹ Abdlrheem SS et al. from Egypt showed that amblyopia was seen in 132 (3.3%) out of 4060 children between the age range of 07-12 years. Out of these 132, anisometropic children were (51.5%), isometropic children were (21.2%), strabismic children were (10.6%), sensory deprivation children were (9.1%) and mixed amblyopic children were (7.6%).¹⁰

Our study revealed a relatively higher prevalence of amblyopia in boys as compared to the study conducted by Mocanu et al.,¹¹ which showed a higher prevalence of amblyopia in girls while our study results are in accordance to the study conducted by Ikuomenisan et al.,²⁰ which showed that more males were amblyopic. Although gender is not a recognized ARF, these differences call for further studies. Frequency of amblyopia in our study is higher than studies conducted in Egypt,¹⁰ Iran,¹⁹ Nigeria²⁰ and Europe.²¹ This difference may be due to the differences in study settings, our study was community-based while above studies were carried out in schools, which missed children who left schooling because of their poor visual status. Other difference might be due to variation in the social and demographic characteristics of the participants. The results of our study are lower than studies done in southwest Nigeria²² and Saudi Arabia²³ which reported prevalence of amblyopia 12.9% and 9.5% respectively. This disparity may be due to the differences in study settings. Previous studies^{10,11,19} reported anisometropia as the most common cause of amblyopia, our study also showed anisometropia being the most common cause in our amblyopic children. Anisometropia is fortunate as it can be treated easily with optical correction and patching.

This study concluded that frequency of amblyopia in children aged 06-13 years is high. So, this particular age group should be given special consideration for early and effective management of this disorder. If Amblyopia is not managed timely it will affect quality of life and daily activities of these children.

Our study is limited being hospital based study as very few visually normal children visit

hospital for routine eye examination. Secondly this study was done in a single center with a smaller sample size and shorter follow-up period. So results of this study are not a real picture of our pediatric population. Further, large prospective studies on amblyopia are needed to address this issue.

It is recommended that vision assessment and amblyopia screening of all children should be carried out at the time of school admission all over the Pakistan by trained primary school teachers or health personnel using simple distance VA charts. Effective public health awareness programs with strong involvement of parents are required in the management of such children. General practitioners and pediatricians can be trained to assess VA and amblyopia in children in their clinics for early detection, referral, diagnosis and timely management leading to better quality of life for these children.

Conflict of interest: None declared.

References

1. Al Ammari HM, Al Shamlan FT. Amblyopia Treatment Efficacy in Anisometropia. *Clin Ophthalmol*. 2019; 13: 2395-402.
2. Tariq M, Zeb J, Iqbal S, Younas A, Rashid MA. Frequency of amblyopia according to its types in 5-15 years age group attending eye OPD at Al-nafeeshospital, Islamabad. *J Res Med Med Sci* 2021; 2 (4): 94-8.
3. Ali A, Ahmad I, Ayub S. Prevalence of undetected refractive errors among school children. *Biomedica* 2007; 23(2): 96-101.
4. Sachan N, Srivastava D, Jain PK, Bajpai PK, Singh SK, Mehra J. Prevalence of undetected refractive errors among school children: a cross sectional study in urban Etawah, India. *Int J Community Med Public Health* 2018; 5: 4608-12.
5. Ashrafi E, Jamali S, Mohammadi SF, Mehdipoor P. National and sub national prevalence of Amblyopia and its trends from 1990 to 2018 in Iran. *J Optom* 2020; 13(2): 113-9.
6. Kraus CL, Culican SM. New advances in amblyopia therapy I: Binocular therapies and pharmacologic augmentation. *Br J Ophthalmol* 2018; 102 (11): 1492-6.
7. Rocha MNAM, De Ávila MP, Isaac DLC, Mendonça LSDM, Nakanishi L, Auad LJ. Prevalence of eye diseases and refractive errors in children seen at a referral center for ophthalmology in the central-west region, Brazil. *Rev Bras Oftalmol*. 2014; 73(4): 225-9.
8. Harrington S. 2019. Prevalence of ametropia, amblyopia, and visual impairment in school children in Ireland. Doctoral thesis, Technological University Dublin; 2019. (Accessed on 15th October 2023) Available from URL: <https://arrow.tudublin.ie/sciendoc/224/>

9. Ajmal Ch M, Chaudhary MA, Bukhari MN, Ahmed N. Prevalence of visual dysfunction and ocular motility disorders in developmentally delayed patients. *Pak J Med Sci* 2023; 39(6): 1747-50.
10. Abdlrheem SS, El Hameed Gaber WA, El Ameen AAM, Dabour S, Othman T, Meabed AA, et al. Prevalence of Amblyopia among primary school children in aswan governorate, Egypt. *Ann Trop Med Public Health* 2020; 23 (14); doi: 10.36295/asro.2020.231417.
11. Mocanu V, Horhat R. Prevalence and risk factors of amblyopia among refractive errors in an Eastern European population. *Medicina* 2018; 54(1): 6.
12. Meng Z, Fu J, Chen W, Li L, Su H, Dai W, et al. Prevalence of Amblyopia and Associated Risk Factors in Tibetan Grade One Children. *Ophthalmic Res* 2021; 64(2): 280-9.
13. Al-Romhein P, Fröhlich M, Schmickler S, Salchow DJ. Detections of refractive risk factors for amblyopia with Plusoptix Autorefractor A09. *Ophthalmologie* 2022; 119(10): 1035-40.
14. Rashad MA, Abd Elaziz KM, Fawzy SM, Abdel Latif AAM, Abdel Latif MAM. Screening of Primary School Children for Amblyopia and Amblyogenic Factors in Central Cairo, Egypt. *J Ophthalmol.* 2018; 2018: 8425319.
15. Margines JB, Huang C, Young A, Mehravaran S, Yu F, Mondino BJ, et al. Refractive Errors and Amblyopia Among Children Screened by the UCLA Preschool Vision Program in Los Angeles County. *Am J Ophthalmol* 2020; 210: 78-85.
16. Shah M, Habib ur Rehman, Khan MT, Khan MD. Clinical profile of amblyopia in Pakistani children age 3 to 14 years. *J Coll Physicians Surg Pak* 2005; 15(6): 353-7.
17. Alkhairi S, Siddiqui F, Mazhar-ul-Hasan. Prevalence of Amblyopia Amongst children Presenting in a Tertiary Care Center in Karachi. *Pak J Ophthalmol* 2016; 32 (3): 176-81.
18. Malik N, Masud H, Basit I, Noor P. Frequency of refractive error and amblyopia in strabismus in pediatric age group. *Pak Armed Forces Med J* 2021; 71(2): 405-08.
19. Rajavi Z, Sabbaghi H, Baghini AS, Yaseri M, Moein H, Akbarian S, et al. Prevalence of amblyopia and refractive errors among primary school children. *J Ophthalmic Vis Res* 2015; 10 (4): 408-16.
20. Ikuomenisan SJ, Musa KO, Aribaba OT, Onakoya AO. Risk factors associated with amblyopia among primary school pupils in Kosofe town, Lagos state, Nigeria. *Niger J Ophthalmol* 2018; 26(1): 67-73.
21. Fu Z, Hong H, Su Z, Lou B, Pan CW, Liu H. Global prevalence of amblyopia and disease burden projections through 2040: a systematic review and meta-analysis. *Br J Ophthalmol* 2019; 104(8): 1164-70.
22. Alarape AT, Ulaikere M, Okoye O, Okonkwo O, Mahmoud AO, Nwachukwu N, et al. Burden and spectrum of amblyopia in a pediatric hospital population Southwest Nigeria. *Ann Med Health Sci Res* 2017; 7: 60-6.
23. Al-Tamimi ER, Shakeel A, Yassin SA, Ali SI, Khan UA. A clinic-based study of refractive errors, strabismus, and amblyopia in pediatric age-group. *J Family Community Med* 2015; 22 (3): 158-62.