

Prevalence of Amblyopia Due To Refractive Error in School-Going Children of Narsingdi District In Bangladesh

Mahzabeen R*¹, Bhuiyan BB², Shamsudduha AB³, Islam M⁴, Aktar A⁵

¹Dr. Rishad Mahzabeen, Associate Professor, Department of Community Medicine, Ibrahim Medical College, Dhaka, Bangladesh

²Dr. Md Bazlul Bari Bhuiyan, Associate Professor, Department of Ophthalmology, Holy Family Red Crescent Medical College, Dhaka, Bangladesh

³ Dr. A B Shamsudduha, Associate Professor, Department of Ophthalmology, Lions Eye Institute & Hospital, Agargaon, Dhaka

⁴Dr. Md. Mominul Islam, Associate Professor, Department of Vitreo Retina & Uveitis, Ishpahani Islamia Eye Institute & Hospital, Dhaka, Bangladesh

⁵Dr. Asma Aktar, Assistant Registrar, National Institute of Ophthalmology, Dhaka, Bangladesh

Abstract

Background: Amblyopia, whether bilateral or unilateral, causes reduced vision despite outwardly healthy eyes, often emerging in childhood between ages 6 and 9. While a contributor to visual impairment, it is preventable blindness. Early identification and treatment before age 7 offer the best prospects for complete correction.

Aim of the study: This study aimed to assess the prevalence of amblyopia due to refractive error in school-going children of Narsingdi district in Bangladesh.

Methods: This prospective observational study was conducted at Narsingdi Eye Care & Research Centre, Narsingdi, Bangladesh from January 2018 to December 2022. Purposively it involved 1978 school-going children who attended the hospital. Best-corrected visual acuity and detailed ophthalmic evaluation were performed on all participants and data processing and analysis were carried out using MS Office tools.

Results: Nearly three-fourths of the participants (74.3%) had myopia followed by 28.8% who had astigmatism, and 6.1% who had hypermetropia as the refractive errors. The prevalence of amblyopia due to refractive error was 1.67%. Among the total 1978 cases, 15 had shallow amblyopia, and 18 had deep amblyopia.

Conclusion: Amblyopia due to refractive error in school-going children in Narsingdi, Bangladesh, is relatively low. Raising awareness among parents and implementing school screening programs can help reduce its prevalence.

Keywords: Prevalence, Amblyopia, School-going, Children, Refractive error, BCVA.

Date of Submission: 08-10-2023

Date of Acceptance: 18-10-2023

I. INTRODUCTION

Amblyopia has been defined as a unilateral or bilateral decrease of visual acuity caused by deprivation of pattern vision or abnormal binocular interaction [1]. Even though no cause can be detected by physical examination of the eye, some cases will improve with the treatment clinically. The prevalence of amblyopia in the literature ranges from 0.7% to 5%, depending on the characteristics of the study population, visual acuity criteria, and measurement methods [2,3]. The prevalence of amblyopia has been reported in several studies [4,5], ranging from 0.2% in a school-based study of children aged 7 to 19 years in Tanzania [6], 1.8% in a school based study of Australian children aged 6 years [7], to 3.6% in British children aged 7 years in the Avon Longitudinal Study of Parents and Children (ALSPAC) [8]. 'Stager suggested that Amblyopia is one of the most common eye problems in children. Early treatment can eliminate Amblyopia [9]. Amblyopia results from abnormal development of the visual system in early childhood. The visual cortex needs continuous, clear, and focused visual impulses to develop normally [10, 11]. Children with amblyogenic risk factors, if not treated, are vulnerable to functional reduction of visual acuity causing amblyopia [12, 13]. The causes of amblyopia are strabismus, high refractive error, anisometropia, and opacities of the ocular media, or a combination of two or more etiologies in the same patient. Despite different causes, the basic mechanisms in all cases are either abnormal binocular interaction between eyes or deprivation in one or both eyes. Visual loss due to amblyopia can be permanent if corrective measures are not taken in time. The burden of disability due to this problem can become massive when one takes into account the duration of life with visual disability [14]. Early detection of refractive error defects

and strabismus and ocular causes will prevent amblyopia. Simon observed that screening for strabismus, refractive, and ocular disease conditions directly associated with Amblyopia is proven. A prevalence of 4.4% has been reported in New Delhi and 1.9% in south China among 5 to 15-year-old children [15]. The objective of this current study was to assess the prevalence of amblyopia in school-going children in Narsingdi District in Bangladesh.

II. METHODOLOGY

This was a descriptive cross-sectional study that was conducted at Narsingdi Eye Care & Research Centre, Narsingdi, Bangladesh from January 2018 to December 2022. In total 1978 school-going children who attended the mentioned hospital were enrolled in this study as the study subjects. Best-corrected visual acuity and detailed ophthalmic evaluation were performed on all participants. A diagnosis of amblyopia due to refractive error was based on a best corrected visual acuity of 6/12 or less in one or both eyes or a bilateral difference of at least two best-corrected visual acuity lines. Properly written consent was taken from all the participants before data collection. According to the exclusion criteria of this study, children with mental retardation, ptosis covering the pupil, media opacity, and other factors leading to deprivation amblyopia, congenital ocular anomalies, impaired fixation such as nystagmus, eccentric fixation and any other surgical procedure involvement as well as organic eye disorder were excluded from this study. All the demographic and clinical information of the participants was recorded. All data were processed, analyzed and disseminated by using MS Office tools.

III. RESULT

The majority of our participants, comprising 90.5% of the group, were older than 8 years, while 9.5% were 8 years or younger. Gender distribution was nearly equal, with 41.6% being male and 58.4% female. In terms of residence, a significant proportion, 65.8%, hailed from rural areas, while the rest, 34.2%, came from urban locales. The best-corrected visual acuity (BCVA) findings in this study provide valuable insights into the visual health of the participants. The majority exhibited excellent vision, with 83.2% having a BCVA of 6/6 in the right eye and 85.0% in the left eye. A significant proportion also showed good visual acuity, with 11.7% and 10.5% having a BCVA of 6/9 in the right and left eyes, respectively. The prevalence of lower BCVA categories, such as 6/12, 6/18, 6/24, 6/36, and 6/60, was relatively low, underscoring the overall positive visual outcomes in this study population. In examining the distribution of refractive errors among the study participants, we observed that myopia was the most prevalent, affecting 74.3% of the sample, followed by astigmatism at 28.8%. A smaller proportion had hypermetropia, accounting for 6.1%. In this study, the prevalence of amblyopia due to refractive error was found to be 1.67%, affecting 33 of the total cases. Among these amblyopia cases, less than half (45%) of them were classified as having shallow amblyopia, while the other half exhibited the deep form.

Table 1: Participants' socio-demographic status

Characteristics	n	%
Age		
≤ 8 years	187	9.5%
>8 years	1791	90.5%
Gender		
Male	823	41.6%
Female	1155	58.4%
Residence		
Rural	1302	65.8%
Urban	676	34.2%

Table 2: BCVA of the study participants

BCVA	BCVA (Right eye)		BCVA (Left eye)	
	n	%	n	%
6/6	1645	83.2%	1681	85.0%
6/9	232	11.7%	208	10.5%
6/12	41	2.1%	33	1.7%
6/18	41	2.1%	34	1.7%
6/24	10	0.5%	8	0.4%
6/36	4	0.2%	11	0.6%
6/60	5	0.3%	3	0.2%
Total	1978		1978	

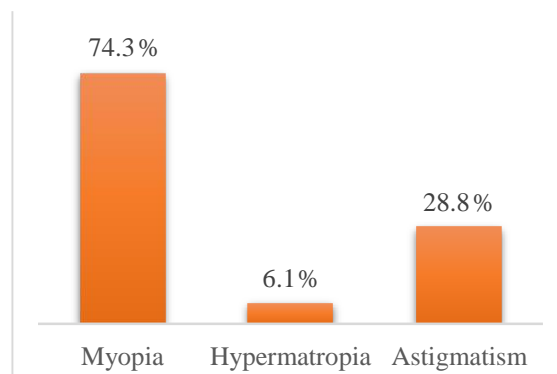


Figure 1: Refractive error distribution

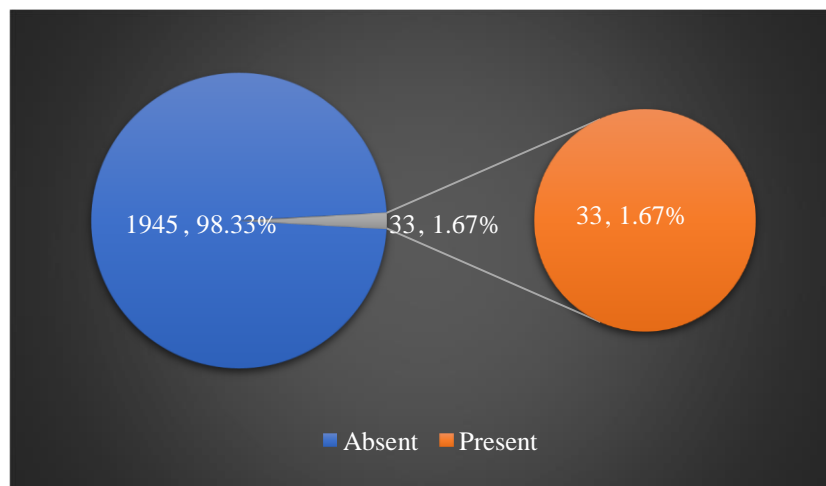


Figure 2: Prevalence of amblyopia due to refractive error

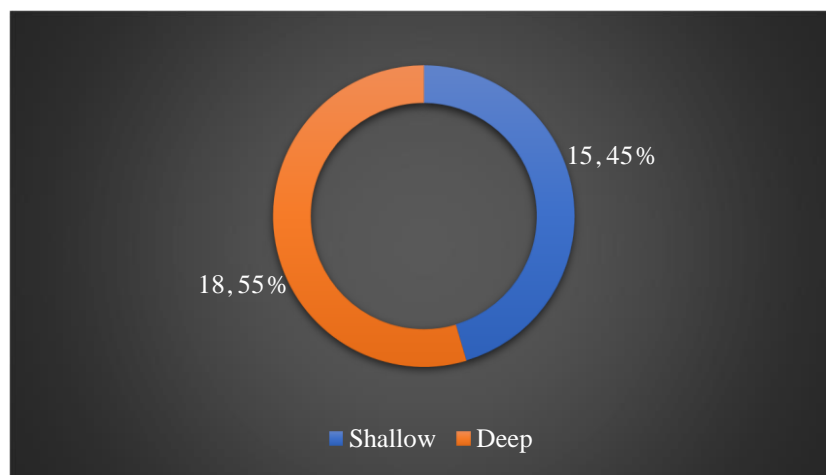


Figure 3: Amblyopia patterns (n=33)

IV. DISCUSSION

This study aimed to assess the prevalence of amblyopia in school-going children in Narsingdi District in Bangladesh. In our study, the analysis of age distribution among participants revealed a significant majority (90.5%) falling into the ≥ 8 years age group, while a minority of only 9.5% were in the < 8 years age group which was comparable with another study [16]. This observation also aligns with the understanding that amblyopia typically develops during early childhood, up to the age of 7 to 8 years, and can be effectively managed if identified and treated before the age of 9 to 10 years [17]. In terms of gender distribution within our study, 58.4% were female, while 41.6% were male. Additionally, when examining participants' residences, 34.2% hailed from

urban areas, with the remaining 65.8% originating from rural backgrounds. A similar study reported the screening of 4020 children aged 5–15 years, with 58% attending rural schools and 42% from urban schools. Within that cohort, there were 52% boys and 48% girls [18]. The significant findings in this study about Best Corrected Visual Acuity (BCVA) in both the right and left eyes of the 1978 participants highlight a predominantly high level of visual acuity. In this study, most participants had excellent vision, with 83.2% having a BCVA of 6/6 in the right eye and 85.0% in the left eye. A smaller proportion showed good visual acuity, with 11.7% and 10.5% achieving a BCVA of 6/9 in the right and left eyes, respectively. Lower BCVA categories were less common, reflecting generally positive visual outcomes in the study group. These findings underscore the overall good eye health within the study population, with only smaller percentages experiencing lower acuity levels. In a related study [19], the severity of amblyopia was further classified into mild to moderate (BCVA 6/12–6/36) and severe (BCVA <6/36). In our study, myopia was identified as the most prevalent refractive error, affecting the majority at 74.3%, followed by astigmatism at 28.8% and hypermetropia at 6.1%. Specifically, amblyopia due to refractive error was found in 1.67% of the participants, totaling 33 cases within the cohort. Among these cases of amblyopia, an equal distribution was observed, with half classified as shallow amblyopia, while the remaining half exhibited the deep form. Pradhan N et al. conducted a study on refractive errors in Haryana, where they found hypermetropia to be prevalent in 14% of the participants [20]. In our study, aside from myopia, the most frequent refractive errors identified was astigmatism (28.2%), and the rate of hypermetropia was only 6.1%. These findings were consistent with a comparable trend observed by Sonam Sethi et al., who reported astigmatism at 20.4% and hypermetropia at 11.4% [21]. Among our total participants, only 1.67% had amblyopia, which was less than the 4.4% prevalence reported by GV Murthy et al. in 2002 in New Delhi [22]. Additionally, our prevalence rate of amblyopia was lower than in two other studies conducted in India [23,24] and one in Gondar, Ethiopia, which reported amblyopia prevalence rates of 4.8% and 5.14%, respectively. However, our findings were nearly similar to the findings of some other studies conducted in Egypt, Lagos state Nigeria [25], Southern India [26], and Eastern Europe [27], which reported lower amblyopia prevalence rates of 1.49%, 1.41%, and 1.1%, respectively.

Limitation of the study:

This study had several limitations that should be considered when interpreting its findings. Firstly, it was a single-centered study with a relatively small sample size, which may limit the generalizability of the results to a larger population. Additionally, the study was conducted over a relatively short period, potentially not capturing seasonal or temporal variations in the prevalence of amblyopia. Therefore, it's important to acknowledge that the findings of this study may not fully represent the broader scenario of the entire country and should be interpreted with caution in a broader national context.

V. CONCLUSION & RECOMMENDATION

In conclusion, although the prevalence of amblyopia due to refractive error among school children of Narsingdi district in Bangladesh, is currently at a relatively low rate of 1.67%, it is imperative to take proactive measures to sustain this positive trend. These measures encompass increasing awareness among parents about timely eye screenings, establishing effective school-based screening programs, ensuring access to affordable eye care services, and providing necessary follow-up and treatment. By addressing amblyopia and other eye conditions in a comprehensive and systematic manner, we can safeguard the visual health and overall development of the district's school children, ultimately contributing to their brighter and healthier futures.

Funding: No funding sources.

Conflict of interest: None declared.

References

- [1]. Von Noorden GK. *Binocular Vision and Ocular Motility: Theory and Management of Strabismus*, 5th ed. St Louis, Missouri: Mosby-Year Book Inc.; 1996
- [2]. Grönlund MA, Anderson S, Aring E, Hård AL, Hellström A. Ophthalmological findings in a sample of Swedish children aged 4- 15 years. *Act Ophthalmic Scand* 2006; 84:169- 176.
- [3]. Robaei D, Rose K, Ojaimi E, Kifley A, Huynh S, Mitchell P. Visual acuity and the causes of visual loss
- [4]. in a population- based sample of 6- year- old Australian children. *Ophthalmology* 2005; 112:1275- 1282. [4] Fotouhi A, Hashemi H, Mohammad K, Jalali KH. The prevalence and causes of visual impairment in
- [5]. Tehran: the Tehran Eye Study. *Br J Ophthalmol* 2004; 88:740–5.
- [6]. MEPEDES Group. Prevalence of amblyopia and strabismus in African American and Hispanic children ages 6 to 72 months the multi-ethnic pediatric eye disease study. *Ophthalmology* 2008; 115:1229–36. e1.
- [7]. Wedner SH, Ross DA, Balira R, et al. Prevalence of eye diseases in primary school children in a rural area of Tanzania. *Br J Ophthalmol* 2000; 84:1291–7.
- [8]. Robaei D, Rose KA, Ojaimi E, et al. Causes and associations of amblyopia in a population-based sample of 6-year-old Australian children. *Arch Ophthalmol* 2006; 124:878–84.
- [9]. Williams C, Northstone K, Howard M, et al. Prevalence and risk factors for common vision problems in children: data from the ALSPAC study. *Br J Ophthalmol* 2008; 92:959–64.

- [10]. Stager DR. Amblyopia and the pediatrician. Paed ann.1983 Aug; 12(8):574-6, 578-84. [Online], cited on
- [11]. 30th August 2008. Available at URL <http://www.ncbi.nlm.nih.gov/pubmed/6622077>
- [12]. Hatt S, Antonio- Santos A, Powell C, Vedula SS. Interventions for stimulus deprivation amblyopia. Cochrane Database Syst Rev 2006; (3): CD005136.
- [13]. Epelbaum M, Milleret C, Buisseret P, Dufier JL. The sensitive period for strabismus amblyopia in humans. Ophthalmology 1993;100:323- 327
- [14]. Webber AL, Wood J. Amblyopia: Prevalence, natural history, functional effects and treatment. Clin Exp Optom 2005; 88:365 - 375.
- [15]. Simons K, Preslan M. Natural history of amblyopia untreated owing to lack of compliance. Br J Ophthalmol 1999; 83:582- 587.
- [16]. Murthy GV, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, Sanga L, et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci 2002; 43:623- 631.
- [17]. He M, Zeng J, Liu Y, Xu J, Pokharel GP, Ellwein LB. Refractive error and visual impairment in urban children in southern China. Invest Ophthalmol Vis Sci 2004; 45:793- 799.
- [18]. Levi DM. Visual processing in amblyopia: human studies. Strabismus. 2006; 14:11-9.
- [19]. Park KH, Hwang JM, Ahn JK. Efficacy of amblyopia therapy initiated after 9 years of age. Eye (Lond) 2004; 18:571-4.
- [20]. Ganekal, Sunil, et al. "Prevalence and etiology of amblyopia in Southern India: results from screening of school children aged 5-15 years." Ophthalmic epidemiology 20.4 (2013): 228-231.
- [21]. Von Noorden GK. Classification of amblyopia. Am J Ophthalmol 1967; 63(2):238-244.
- [22]. Pradhan, Nitesh, et al. "Prevalence of refractive errors among school children of 6-12-years of age group and reason for not using spectacles even after correction." Int J Res Med Sci 6.3 (2018): 798-801.
- [23]. Sethi S, Kartha GP. Prevalence of refractive errors among school children (12- 17 years) of Ahmedabad city. Ind Journal of Com Med, 2000; 25: 181-83.
- [24]. Murthy GV, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, Sanga L, et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci 2002; 43:623- 631.
- [25]. Janti SS, Raja A, Matheen A, Charanya C, Pandurangan R. A cross-sectional study on prevalence of amblyopia in school going children. J Evol Med Dent Sci. 2014;3(30):8561-8566. doi:10.14260/jemds/ 2014/3086.
- [26]. Sherief, Sadik & Deyessa, Mihret. (2022). PREVALENCE AND ETIOLOGY OF AMBLYOPIA
- [27]. AMONG PRIMARY SCHOOL CHILDREN IN WOLLISO TOWN: SOUTH WEST SHEWA ZONE,
- [28]. ETHIOPIA. Ethiopian Medical Journal. 60. 27-31.
- [29]. Robaei D, Rose K, Ojaimi E, Kifley A, Huynh S, Mitchell P. Visual acuity and the causes of visual loss in a population-based sample of 6-year-old Australian children. Ophthalmology. 2005;112(7):127582. doi: 10.1016/j.ophtha.2005.01.052.
- [30]. Ganekal S, Jhanji V, Liang Y, Dorairaj S. Prevalence and etiology of amblyopia in Southern India: results from screening of school children aged 5-15 years. Ophthalmic Epidemiol. 2013;20(4):228-231. doi:10.3109/09286586.2013.809772.
- [31]. Mocanu V, Horhat R. Prevalence and risk factors of amblyopia among refractive errors in an Eastern European population. Medicina. 2018;54(1):6. doi:10.3390/medicina54010006.