

PREVALENCE OF EYE DISORDERS IN CHILDREN PRESENTING IN OUTPATIENT DEPARTMENT WITH ASTHENOPIA

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Abstract:

Introduction: Asthenopia is a common complaint in school going children. The magnitude of the problem in our region is not known.

Methodology: Children (5-18 years) presenting in pediatric and ophthalmology outpatient department with symptoms (defined *a priori*) were included in study. Exclusion criteria included BCVA of less than 6/9 in either eye, strabismus, ocular or systemic diseases affecting binocular vision, and using any medication that can impact accommodation or convergence. Previous day 24 hour recall method was used to assess the time spent on various activities. Subsequently, detailed refractive assessment was done.

Results: A total of 24200 children with age group 5-18 years visited outpatient department. Out of them 520 (2.1%) children had symptoms of asthenopia. The proportion of males (66.6%) was higher than female (33.4%). The proportion of children with asthenopia increased from 21% in 5-9 year group to 45% in 13-18 year group. Tearing and eye pain were the commonest presenting complaints. The presence of four or more symptoms was not observed in 5-9 age group. Asthenopic children spend a mean of 4.2 hours/day on screen.

Conclusion: Asthenopia is common eye complaint in school children. It can interfere in near work, so warrants prompt treatment.

Introduction

Asthenopia is the one of the commonest presenting complaints in the outpatient department. Patients usually associate these complaints with refractive errors, although in clinical experience, the diagnosis is otherwise. Patients usually presents in outpatient department with headache, watery, burning or itching eyes, blurred vision, eye ache, dry eye sensation, and double vision. (1-4) Its prevalence has been studied in adults since 1970's. (5, 6) Due to increase in screen time the prevalence of asthenopia has increased. (7-13)

The studies evaluating the problem in have showed the prevalence of 19.7% (12.4--26.4%) with majority of children having no visual acuity or refraction problem. (14) Two studies from India have evaluated the problem in children working in factories and

found significant in increase in eye strain in these children. (15, 16) Very few reports of the disease are available among school going children. In study from Iran prevalence of asthenopia in school children was 62.8% (51.9 to 73.8). (17) The prevalence of the problem in our part of the world is not known. So, all children reporting to the outpatient department of Pediatrics and ophthalmology were evaluated for asthenopia.

Methodology

All children 5-18 years presenting in Pediatrics and Ophthalmology outpatient department with symptoms of asthenopia were included. Asthenopia was defined as presence of atleast one of the ten symptoms of eye pain, dry eyes, eye swelling, blurred vision, diplopia, foreign body sensation, photophobia, tearing, decreased visual acuity, and difficulty in

sustaining visual operations.(18, 19) Exclusion criteria included BCVA of less than 6/9 in either eye, strabismus, ocular or systemic diseases affecting binocular vision, and using any medication that can impact accommodation or convergence. The study was conducted from August 2017 to August 2018. A written informed consent was taken from the parents for inclusion into the study.

Baseline demographic data was collected in Performa. Previous day 24 hour recall method was used to assess time spend in hours on screen (screen time includes computer, tablet, laptop, mobile, television), studying in class and looking at blackboard, reading/writing and sports/physical activity

Children were first tested 3 times for non-cycloplegic auto-refraction by a skilled operator. In the next stage, all participants were tested for uncorrected visual acuity (UCVA). Then, auto-refraction results were refined through retinoscopy, and trial lenses. For each student, first the right and, then, the left eye was tested. For any case with UCVA worse than 6/9 in either eye, subjective refraction was done and the best corrected visual acuity (BCVA) was recorded. Then, far (6 meters) and near (40 cm) cover tests were done using accommodative targets (a single letter 1 line above acuity threshold) and the alternate cover test with prism bar was carried out to diagnose and measure phoria. In the next stage, the near point of accommodation (NPA) was measured with the Donder push-up method using Royal Air Force Rule (RAF) and near print equivalent to 6/9 VA as accommodative target. The target was slowly moved closer to the child along the midline and he/she was asked to report the first sustained blur. To increase the reliability of the test, the measurement was done 3 times and the average NPA was recorded. The average NPA was, then, converted to amplitude of

accommodation (AA) in Diopter. The near point of convergence (NPC) was measured similar to AA; instead, the participant was instructed to report the first sustained diplopia of the target. Again, the NPC was measured 3 times and the average was recorded. The gradient accommodative-convergence / accommodation (AC/A) ratio was determined by re-measurement of near phoria by adding -1.00 minus lenses to subjective refraction and comparing the result with the baseline near.(17)

Quantitative variables were expressed as mean ±SD, and whereas qualitative variables were given as numbers and percentage. Data analysis was done using IBM-SPSS v.20 and Microsoft Excel.

Results

A total of 24200 children with age group 5-18 years visited outpatient department. Out of them 520 (2.1%) children had symptoms of asthenopia. Mean age of presentation was 10.1± 3.5 years. The baseline demographic data and degree of asthenopia is summarized in Table 1. Mean spherical equivalent refraction in the total sample was -0.89 ± 2.13 D; it was -0.87 ± 1.28 D and -0.90 ± 1.23 D in females and males, respectively. The proportion of children with asthenopia increased from 21% in 5-9 year group to 45% in 13-18 year group. The presence of four or more symptoms was not observed in 5-9 age group. Table 2 shows the frequency of symptom in these children. Tearing and eye pain were the commonest presenting complaints. Mean time spent by children in various daily activities is shown Table 3. Asthenopic children spend a mean of 4.2 hours/day on screen. Table 4 summarizes mean and standard deviation of AA, NPC, and AC/A ratio in Asthenopic children. Mean (±sd) near esophoria was 0.4 ± 0.03 prism diopters. Significant near exophoria (with > 6 Prism diopters) was seen in 255 (49%) children.

Table 1: Baseline demographic data and degree of asthenopia

1. Variable	2. ≥ One symptom (%)	3. ≥2 symptom (%)	4. ≥3 symptoms (%)	5. ≥4 symptoms (%)
6. Total	7. 520	8. 251(48.2)	9. 144 (27.6)	10. 94 (18)
11. Male	12. 346 (66.6)	13. 166 (47.9)	14. 97 (28)	15. 65 (19)
Female	174 (33.4)	85 (48.8)	47 (27)	29 (16.6)
Age group (5-9 years)	109 (21)	56 (22.3)	25 (17.3)	0 (0)
Age group (10-14 years)	177 (34)	75 (29.8)	46 (31.9)	20 (21.2)
Age group (15-18 years)	234 (45)	120 (47.8)	73 (50.6)	74 (78.8)

Table 2: Symptoms frequency in children with asthenopia

Symptom	N (%)
Tearing	490 (94.2)
Eye pain	390 (75)
Blurring of vision	250 (48)
Decreased visual acuity	200 (38.4)
Photophobia	190 (36.5)
Diplopia	100 (19.2)
Dry eye	95 (18.2)
Foreign Body sensation	72 (13.8)
Eye swelling	25 (4.8)
Difficulty sustained visual operation	12 (2.3)

Table 3: time spend/day based upon 24 hour recall method

Variable (in hours/day)	Hours/day (mean ± sd)
Screen time (mean ± sd)	4.2 ±1.6
Studying in class and looking at blackboard (mean ± sd)	4.5±.0.8
Reading/ writing (mean ± sd)	3.1±2.1
Sports/Physical activity (mean ± sd)	2.5± 1.6

Sd : standard deviation.

Table 4: Mean and Standard Deviation of Amplitude of Accommodation (AA), Near Point of convergence (NPA) and Accommodative-Convergence over Accommodation ratio (AC/A) in Asthenopic Children

Parameters	Mean ± sd
AA, diopters	11.12 ± 1.92
NPC, cm	7.12 ± 2.21
AC/A	2.54 ± 1.32

Discussion

This study is hospital based survey of children presenting with symptom of asthenopia. The hospital based prevalence in children (5-18 years) attending Pediatric and Ophthalmology Outpatient Department was 2.1%. This is markedly less than the asthenopia prevalence in population based survey in school children; these studies have shown prevalence of 12.4-57%. (14, 17, 19, 20) This difference is can due to admission bias. Furthermore, the health seeking behavior in may be lacking.

In our study the proportion of male with asthenopia was higher as compared to girls. Similar results were seen by study by Hashemi H et al.(17) Ma L et al (21) showed a higher prevalence in females; while, Han et al.(19) showed no difference between the genders. This could be due to preference given to male child in our society; no scientific hypothesis could be made based upon gender. Age was as important determinant in asthenopia. The proportion of children with asthenopia increased with increase in

age. Similar finding were observed in other studies. In 6 year old the prevalence of eye strain was found to be 15.2%.(22) In contrast, study by Sterner et al showed no signs of asthenopia in less than 7.5 years, whereas prevalence was 47.2% in children aged 7.5 to 10 years during near work.(23) Other studies in adults have shown increase in symptoms with increasing age.(18, 24) Based upon these observations it could be hypothesize that with increase in age, more people are involved in near work and with pre-existing accommodative and binocular disorder, more symptoms are seen. The mean screen time in our study was 4.2 ± 1.6 hours. This was nearly similar to study by Hashemi H et al.(17) The association of asthenopic symptoms with screen time has already been explored by various studies and this could be due to overstimulation of accommodation, imbalance in the convergence and accommodation relationship, and dry eye.(23, 25) The most common symptom in our study was tearing followed by eye pain. Similar results were obtained by Hashemi H et al.(17) Headache was the

commonest symptom studies by Wajuihian et al, Mvtu et al and Neugebauer et al in adults. (2, 3, 26)

Amplitude of accommodation, a marker of accommodative insufficiency was 11.12 ± 1.92 diopters, which is lower than general population. This can lead to reduced accommodative response and accommodative convergence. Similar results were obtained by Marran et al (27) which suggested accommodative insufficiency as the most important cause of asthenopia in children. Convergence insufficiency, a common binocular visual abnormality, suggested with a remote NPC and low AC/A ratio was seen in our study. Similar results were obtained by Hashemi et al.(17)

Our study had some limitation. The true prevalence can only be assessed by population survey as hospital based survey suffers from admission and reporting bias. Moreover, objective dry eye test were not performed.

References

1. Nakazawa T, Okubo Y, Suwazono Y, Kobayashi E, Komine S, Kato N, et al. Association between duration of daily VDT use and subjective symptoms. *American Journal of Industrial Medicine*. 2002;42(5):421-6.
2. Mvitu MM, Kaimbo WK. [Manifestations of asthenopia in Black subjects]. *Bulletin de la Societe belge d'ophtalmologie*. 2003(289):45-9.
3. Neugebauer A, Fricke J, Russmann W. Asthenopia: frequency and objective findings. *German journal of ophthalmology*. 1992;1(2): 122-4.
4. Graf HP, Flammer J. [Asthenopia in clinical practice: a comparative study of complaints, clinical findings and results of therapy in asthenopic patients (author's transl)]. *Klinische Monatsblätter für Augenheilkunde*. 1980;176(4): 577-82.
5. Waters WE. Headache and the eye. A community study. *Lancet (London, England)*. 1970;2(7662):1-4.
6. Cameron ME. Headaches in relation to the eyes. *The Medical journal of Australia*. 1976;1(10):292-4.
7. Rosenfield M. Computer vision syndrome: a review of ocular causes and potential treatments. *Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians (Optometrists)*. 2011;31(5):502-15.
8. Agarwal S, Goel D, Sharma A. Evaluation of the Factors which Contribute to the Ocular Complaints in Computer Users. *Journal of clinical and diagnostic research : JCDR*. 2013;7(2):331-5.
9. Bergqvist UO, Knave BG. Eye discomfort and work with visual display terminals. *Scandinavian journal of work, environment & health*. 1994;20(1):27-33.
10. Carta A, Pasquini L, Lucchini R, Semeraro F, Apostoli P. [Relation of asthenopia and some ophthalmological, neuropsychological, and musculoskeletal parameters in workers assigned to video display terminals]. *La Medicina del lavoro*. 2003;94(5):466-79.
11. Blehm C, Vishnu S, Khattak A, Mitra S, Yee RW. Computer vision syndrome: a review. *Survey of ophthalmology*. 2005;50(3):253-62.
12. Ong CN, Hoong BT, Phoon WO. Visual and muscular fatigue in operators using visual display terminals. *Journal of human ergology*. 1981;10(2):161-71.
13. Taino G, Ferrari M, Mestad IJ, Fabris F, Imbriani M. [Asthenopia and work at video display terminals: study of 191 workers exposed to the risk by administration of a standardized questionnaire and ophthalmologic evaluation]. *Giornale italiano di medicina del lavoro ed ergonomia*. 2006;28(4):487-97.
14. Vilela MAP, Pellanda LC, Fassa AG, Castagno VD. Prevalence of asthenopia in children: a systematic review with meta-analysis. *Jornal de Pediatria*. 2015;91(4):320-5.
15. Tiwari RR. Eyestrain in working children of footwear making units of Agra, India. *Indian pediatrics*. 2013;50(4):411-3.
16. Tiwari RR, Saha A, Parikh JR. Asthenopia (eyestrain) in working children of gem-polishing industries. *Toxicology and industrial health*. 2011;27(3):243-7.
17. Hashemi H, Khabazkhoob M, Forouzes S, Nabovati P, Yekta A, Ostadi moghaddam H. The Prevalence of Asthenopia and its Determinants Among Schoolchildren 2017.
18. Bhandari DJ, Choudhary S, Doshi VG. A community-based study of asthenopia in computer operators. *Indian J Ophthalmol*. 2008;56(1):51-5.
19. Han CC, Liu R, Liu RR, Zhu ZH, Yu RB, Ma L. Prevalence of asthenopia and its risk factors in Chinese college students. *International journal of ophthalmology*. 2013;6(5):718-22.

20. Vilela MA, Castagno VD, Meucci RD, Fassa AG. Asthenopia in schoolchildren. *Clinical ophthalmology (Auckland, NZ)*. 2015;9:1595-603.
21. Ma L, Ahati A, Liu XT, Zou ZY, Li Y, Wang MF, et al. [Epidemiology and related factor analysis of visual fatigue in university students of Haidian District of Beijing]. *Beijing da xue xue bao Yi xue ban = Journal of Peking University Health sciences*. 2011;43(3):365-9.
22. Ip JM, Robaei D, Rochtchina E, Mitchell P. Prevalence of eye disorders in young children with eyestrain complaints. *American journal of ophthalmology*. 2006;142(3):495-7.
23. Sterner B, Gellerstedt M, Sjoström A. Accommodation and the relationship to subjective symptoms with near work for young school children. *Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians (Optometrists)*. 2006;26(2):148-55.
24. Mocci F, Serra A, Corrias GA. Psychological factors and visual fatigue in working with video display terminals. *Occupational and environmental medicine*. 2001;58(4):267-71.
25. Owens DA, Wolf-Kelly K. Near work, visual fatigue, and variations of oculomotor tonus. *Investigative ophthalmology & visual science*. 1987;28(4):743-9.
26. Wajuihian S. Frequency of asthenopia and its association with refractive errors 2015.
27. Marran LF, De Land Pn Fau - Nguyen AL, Nguyen AL. Accommodative insufficiency is the primary source of symptoms in children diagnosed with convergence insufficiency. (1040-5488 (Print)).