Research Article

Association of Asthenopia and Convergence Insufficiency in Children with Refractive Error- A hospital based study

Gupta R[1], Sharma B[2], Anand R[3], Bawaria S[4], Dewada R[5]

[1] Dr Rachna Gupta, Associate Professor, Regional Institute of Ophthalmology, Gandhi Medical College Bhopal, [2]Dr Bhavna Sharma, Assistant Professor, RIO, GMC, Bhopal, [3]Dr Reena Anand, Director, RIO, GMC, Bhopal ,[4]Dr Shefali Bawaria, Senior Resident, CIMS, Bilaspur, CG, [5]Dr Rajesh Dewada, Resident, surgical officer, RIO, GMC, Bhopal, India

Address for correspondence: Dr Rachna Gupta, E mail: drrachnagupta2k@gmail.com

Abstract

Introduction: It is estimated that about 14% of people in India with visual impairment are suffering from refractive errors. The prevalence of childhood blindness in India is 0.17% and refractive errors alone are the major treatable cause (33.3%) of the blindness. Assessment of Visual acuity should not be the only criteria for detection of ametropia, as children have strong accomodation. Thus it is emphasizing the importance of refraction testing under cycloplegic drugs. Convergence insufficiency is prevalent in about 7.5% of population. **Purpose:** To study the association of asthenopia and convergence insufficiency with refractive error in children. **Methods**: 2130 ametropic children up to 16 yrs were screened for asthenopia and convergence insufficiency. **Result:** Ametropia was found in 40.24% of children .Myopia was prevalent in 47.41% children. Hypermetropia was detected in 15.49% children. Convergence insufficiency was observed in 34.14% of children and asthenopia was found in 82.19% ametropic children. **Conclusion:** The study reveals that, asthenopia and convergence insufficiency are found to be the most common ocular conditions associated with ametropia.

Key words: Convergence insufficiency, asthenopia, hypermetropia, Myopia, Refractive Error.

Introduction

Convergence insufficiency (CI) is a common binocular disorder and is associated with symptoms which become more prominent on doing near work[1- 3]. Asthenopia is a very common presenting feature in children with refractive error and convergence insufficiency[4,5]. WHO reported that about 48 million people are blind in the world and 135 million are with low vision (3/60) and if any appropriate action in rehabilitating them has not taken, it is expected to be double by year 2020[6]. Vision 2020: The "Right to Sight" (a global initiation launched by WHO and task force of International Non-Government Organizations) was launched in Geneva on Feb. 18, 1999 by the director general of the WHO, Dr. G.H. Brundtland with the aim to combat the gigantic problem of blindness and low vision in the world[7]. The incidence of CI in the general population is estimated to be 0.1 to 0.2%[8]. While exo deviations are present only in 1% of the general population, Asthenopia and CI are present in 11-19% of children with an exodeviation[9]. There is great variability in the reported prevalence of CI ranging from 1.75 to 33%, with the average prevalence reported to be approximately 5%. Asthenopia is a group of symptoms experienced during near work, like headache, unable to

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see blackboard, eye ache, goes close to television, watering, blurring of vision during reading, picked up in school, frequent blinking/rubbing of eyes, redness of eyes, change in palpebral aperture, recurrent swelling of lids, double vision during reading/writing, burning sensation, deviation of eyes and frequent fall.

Asthenopic symptoms are more commonly experienced in children with uncorrected refractive error, general weakness, anemia, nutritional deficiency, extra ocular muscle weakness and latent strabismus[10].

The prevalence of childhood blindness in India is 0.17% and it is estimated that about 14 percent of population would benefit from correction of refractive errors[11].

Treatable refractive error is the major cause (33.3%) of the blindness in children, [6, 11] (Global Initiative for the Elimination of Avoidable Blindness. Geneva: WHO. 1997). This study attempted to find the association of convergence insufficiency and asthenopia with refractive errors.

Material and Methods

Present study was undertaken at tertiary eye care centre of central India. Children up to 16 years were screened to find association of convergence insufficiency and asthenopia with refractive errors. It was a cross sectional hospital based study.

Inclusion criteria: children up to 16 years attending OPD.

Exclusion criteria: children > 16 years, post traumatic and post surgical cases.

The demographic profile in terms of name, age, sex, address & socioeconomic status were noted. Detailed history of patients was taken and symptoms were recorded in three categories

1) Ocular - pain in eyes, recurrent redness, deviation of eyes or heaviness.

2) Visual - Blurring of vision while reading or defective vision for distance or near.

3) Referred - headache, nausea or vomiting.

Family history of refractive error in siblings and parents, cerebral palsy or Down's syndrome or other relevant neurobehavioral abnormality was recorded. Personal history and any significant antenatal, perinatal and postnatal history were noted.

Visual acquity was noted and detailed ocular examination was conducted to look for any ocular morbidity.

Objective assessment of refractive error was done by Retinoscopy to evaluate the type and amount of ametropia and fundus examination was done under mydriasis to evaluate any posterior segment involvement[12].

The cycloplegic used were atropine 1% eye ointment / homatropine 0.5% eye drop / cyclopentolate 1% / tropicamide 1% eye drops.

When the refraction had been measured objectively, fogging method of subjective estimation of refraction was done to induce a relaxation of accommodation in absence of cycloplegia[12]. Post mydriatic test was done and suitable spectacles were prescribed[12].

Observation and Result

Out of total 2130 ametropic children examined, myopia was found to be most commonly present (47.41%) in children attending eye OPD, followed by myopic astigmatism (27.88%).

Hypermetropia was present in 15.49% of children, followed by hypermetropic astigmatism (9.2%). Comparing males and females, (p =0.9) is statistically insignificant.

Table No.1: Clinical profile of Convergence Insufficiency

S.NO.	Complaints	No. of cases	%
1.	Headache	1011	82.19
2.	Unable to see blackboard	923	75.04
3.	Eye ache	856	69.59
4.	Goes close to television	756	61.46
5.	Watering	603	49.02
6.	Picked up in school	213	17.31
7.	Frequent blinking/frequent rubbing of eyes	98	7.96
8.	Redness of eyes	98	7.96
9.	Change in palpebral aperture	84	6.8
10	Recurrent swelling of lids	56	4.55
11.	Deviation of eyes	23	1.86
12.	Frequent fall	2	0.16

It is observed that ametropic children present with varied clinical profiles. Headache being the most common presentation, accounts for 82.19%, followed by unable to see blackboard in 75.04% and eye ache in 69.59%. A significant no. of cases presented with goes close to TV 61.46%**,** watering being next 49.02%. Blurring of vision during reading was found in 31.03%, and 17.31% cases were picked up during school screening programme.

Table No 2: Association of Hypermetropia and Myopia with Convergence Insufficiency and Asthenopia

Children with refractive error	Hypermetropic children	Convergence insufficiency and asthenopia	% CI & Asthenopia	Myopic children	Convergence insufficiency and asthenopia	% CI & Asthenopia
GIRLS	163	40	24.53	550	243	44.18
BOYS	167	50	29.94	460	171	37.1
TOTAL	330	90	27.27	1010	414	40.99

Out of 330 hypermetropic children, convergence insufficiency was found in 27.27% of children and asthenopic symptoms were noted in 71.20%. Males were relatively more affected (29.94%) than females (24.53%). Out of 1010 myopic children, convergence insufficiency was found in 40.99% and asthenopia was present in 81.02%. Females (44.18%) were relatively more affected than males (37.10%).

Table No.3: Association of Convergence Insufficiency with degree of Hypermetropia and Myopia

Degree of hypermetropia	No. of hypermetropic children	CI & Asthenopia	% CI & Asthenopia	Degree of myopia	No. of myopic children	CI & Asthenopia	% CI & Asthenopia
<+2 D	96	70	72.91	<-2D	468	357	76.28
+2 D - +4D	202	10	4.95	-2 to -6D	522	47	9.0
>+4D	32	9	28.12	>-6D	20	13	65

Out of 96 children with hypermetropia of <+2 D, 72.91% had convergence insufficiency and asthenopia. Out of 468 children with myopia of <-2 D,76.28% had convergence insufficiency and asthenopia followed by 65% children with myopia of >-6D.

Table No 4: Association of Hypermetropic and Myopic Astigmatism with Convergence Insufficiency and Asthenopia

	Children with Hypermetropic astigmatism	CI and asthenopia	%	Children with Myopic astigmatism	CI and asthenopia	%
GIRLS	104	10	9.61	346	77	22.25
BOYS	92	12	13.04	248	74	29.83
TOTAL	196	22	11.22	594	151	25.42

25.42 % of children with myopic astigmatism had convergence insufficiency and asthenopia, where as 11.22 % of children with hypermetropic astigmatism had convergence insufficiency and asthenopic symptoms.

Myopic astigmatism of -2D to -6 D with the rule was observed in 2.35% males and 2.52% females, against the rule astigmatism in 1.95% males and 1.54% females, oblique astigmatism in 0.56% males and 0.65% females. Myopic astigmatism of >-6 D with the rule was observed in 0.08% males and 0.08% females, against the rule astigmatism in 0.16% males and 0.24% females, oblique astigmatism in 0.08% females. On comparing astigmatism in males and females, p value comes out to be 0.97 which is statistically insignificant. Of 2130 children with refractive error,69 were found to be anemic.

Table No 5: Association of Convergence Insufficiency and Asthenopia with Refractive Errors

% of Hypermetropic children with CI and asthenopia	% of Myopic children with CI and asthenopia	% of children with Hypermetropic astigmatism with CI and asthenopia	% children with Myopic astigmatism with CI and asthenopia
27.27%	40.99%	11.22%	25.42%

Highest association of convergence insufficiency and asthenopia was found with myopia (40.99%), followed by hypermetropia (27.27%). Least association was found with hypermetropic astigmatism (11.22%).

Overall asthenopic symptoms were present in 81.02% myopic children with or without convergence insufficiency, as compared to 72.91% in hypermetropic children. Asthenopia and convergence insufficiency were found to be the most common ocular conditions with ametropia, 82.19% & 34.14% respectively observed in cases presented in eye opd.

Discussion

The present study was carried out to study the association of asthenopia and convergence insufficiency with refractive error in children.

Out of total 2130 ametropic children, Myopia was found to be the most prevalent refractive error found in approximately 47.41% of children [12]. No significant difference in the incidence of refractive errors in boys and girls was noted[13]. Headache was the most common presentation (82.19%) with convergence insufficiency and asthenopia, followed by unable to see blackboard and eye ache[14].

Convergence insufficiency and asthenopic symptoms were most common associated ocular conditions in

children with ametropia[15]. Highest association of convergence insufficiency was found with myopia (40.99%) followed by hypermetropia (27.27%). Similar observations were made in the study done by D.J. Risovic et al. 2008[16], which also showed that myopia as well as hypermetropia is significantly more frequent in the student group than in the nonstudent group.

The prevalence of refractive conditions in this study was found to be myopia 73.9%, hypermetropia 1.5%, and

astigmatism 58.7%. In today's scenario of reading and writing habits, specially keeping books close to eyes, are possible risk factors for myopia and development of asthenopic symptoms[17].

Convergence insufficiency and symptoms of eye strain may prevent children from progressing with their peer group and may cause unnecessary social exclusion.

The study done by Chung and Chong[18] supported the hypothesis that near esophoria is associated with high myopia. The study suggests that near phoria might be an important factor in myopia development. We did not consider myopia progression in our study.

Conclusion

Our study reveals that due to high prevalence of refractive errors among children, school vision screening is very important. Convergence insufficiency and asthenopia is

significantly associated with refractive errors[3]. For detection of ametropia, VA should not be the only criteria, as children have strong accommodation, also convergence insufficiency and latent hypermetropia both present with asthenopic symptoms, emphasizing the importance of refraction under cycloplegia.

Attention of parents and teachers regarding symptoms can be useful for early detection and treatment of asthenopia and convergence insufficiency.

The importance of diagnosing CI in children cannot be underestimated, because if left untreated can lead to difficulties in study which will increase each year with the increase of educational demands.

With early identification of asthenopic symptoms and detection of convergence insufficiency and health education, quality of vision can be maintained & complications can be prevented.

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