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Evaluation of symptoms of Hypermetropia in Children

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ABSTRACT

The main objective was to evaluate the prevalence of different symptoms of hypermetropia in children**.** Also to assess whether there was increase in symptoms with increase in the refractive error. All children who were diagnosed with hypermetropia (at LV Prasad Eye Institute) in at least one eye and who aged between 6-15 years were enrolled in the study. An appropriate sample size of 51 subjects was determined and the questionnaire was given to the parents of all children. Questionnaire was validated and a set of 20 questions was designed. The reliability of the questionnaire was analyzed and it was found to be 0.76. (Cronach's alpha). Participants who could not be seen in the Institute were contacted on phone and the questionnaire was called out to them. All the children enrolled in the study underwent the preliminary examination like vision assessment, dry and cycloplegic refraction, slit lamp examination and a dilated fundus examination at standard ophthalmological set up. Based on the diagnosis and the inclusion criteria, questionnaire was administered to the parents by the examiner. The study showed that increased symptoms with increasing refractive errors in higher powers. It also revealed the fact that frequent checks, follow-ups and change of glasses periodically minimized the symptoms.

Keywords: Hypermetropia, evaluation, symptoms of hypermetropia and children

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INTRODUCTION

Eyes are the windows of learning and visual appreciation of objects contributes to any individual's life. Visual disability in childhood can be minimized, or even prevented if causes are identified early and treated before they become irreversible. Refractive errors are one of the major factors of low vision and preventable blindness, and they serve as the most common reason for the people to visit ophthalmologists and optometrists. The term Hypermetropia derived from hyper, meaning "in excess"; met, meaning "measure"; and opia meaning "of the eye." Hypermetropia is also known as hyperopia), a condition in which with accommodation relaxed, and parallel rays from infinity converge to a focus behind the retina [1]. Hyperopia may be the result of an eye having a relatively short axial length, or reduced diopteric power of one or more of the refractive elements. Classification of hyperopia based on degree :defined as zero to plus two diopter as low (0 to +2.00diopter),plus 2.25 diopter to plus five diopter as moderate(+3.00-+5.00 diopter),and above plus five diopter considered as high hyperopia (>+5.00 diopter)[1].Although children with low or even moderate levels of hyperopia usually do not experience significant visual problems, there are chances that lesser degrees of hyperopia may affect the child's ability to perform well in near work such as reading or schoolwork. However, children with moderate-to-high degrees of hyperopia are at significantly increased risk for the development of amblyopia and strabismus [1].

Amblyopia literally means "dullness of vision.'' It is the decrease of visual acuity in one eye caused by abnormal binocular interaction as a result of pattern vision deprivation during visual immaturity, for which no cause can be detected during the physical examination of the eyes and inappropriate cases, is reversible by therapeutic measures [2].Strabismus is a condition in which the eyes are not properly aligned with each other. It typically involves a lack of coordination between the extra ocular muscles that prevents bringing the gaze of each eye to the same point in space and preventing proper binocular vision, which may adversely affect depth perception [2].

Strabismus can be either a disorder of the brain coordinating the eyes or a disorder of one or more muscles, as in any process that causes a dysfunction of the usual direction and power of the muscle or muscles [2]. Hyperopia is usually present at birth, except in premature infants. Hyperopia decreases in magnitude by 4 years of age[3]. The prevalence of hyperopia less than plus1.25 D (an amount usually difficult to compensate accomodatively) is 4-7 percent between ages 5-20 years, remains constant through early middle age, then increases in populations aged 45 or more according to the refractive errors prevalence study conducted in a rural population in India around 0.8% prevalence of hypermetropia (at least in one eye) was found in the population [4].Studies conducted in urban and rural population showed 3.3% and 3.1% of hyperopia in urban and rural areas respectively and also found hyperopia in younger age in the study group[5].

Role of Accommodation in hyperopia known to everyone, though it has significant contribution in hyperopic patients, accommodation is a process where by a change in the

diopteric power of the crystalline lens occurs so that an in-focus retinal image of an object of regard is obtained and maintained at the high-resolution fovea. As long as there is sufficient accommodative power available, it will automatically "correct" the farsightedness, just like an auto-focus camera. The symptoms of hypermetropia varies with the amount of accommodative power available to neutralize, which is proportional to the age of the patient, the common symptoms of hyperopia are blurred vision, asthenopia, accommodative dysfunction, binocular dysfunction, amblyopia and strabismus[6].Frequently associated symptoms in hypermetropia are blurred vision, frequent headaches, accommodative dysfunction, aching eyes or strained and tearing eyes, difficulty tracking from one line to another or tendency to read the same line over and again[6].

Early detection of hyperopia may help to prevent the complications of strabismus and amblyopia in young children. In older children, uncorrected hyperopia may affect learning ability**,** hyperopia in children often associated with rubbing of eyes, squeezing of eyes, difficulty in studying, poor hand and eye co-ordination, poor reading ability, low intelligence test scores, learning difficulties and delay in visual perceptual skills[7]. Impact of uncorrected hypermetropia on child's life not only interferes with the child's distance and near work but also causes several asthenopic symptoms therefore the child is unable to perform various activities at school such as copying from black board or reading for prolonged periods of time, unable to read without pain and fatigue resulting in poor academic performance. Children may be forced to discontinue schooling due to inability to meet the demands of visual tasks and the discomfort caused by hyperopia. Hyperopes show poorer reading skills and other perceptual anomalies more frequently. As a result, the child faces academic failure thus leading to poor psycho-social development; reduced self-esteem and diminished sense of well-being that are directly linked to reduced opportunities to succeed in life. Enquiring parents of children aged between 5-15 years (who presented to our institute) we obtained the following symptoms: difficulty in board work, headache and blurred vision after one or two hours of reading, parents have noticed their wards copying down wrong spellings from the board constantly, (this elicited them to go for a checkup)frequent change of seats at school, double vision, rubbing of eyes, strain, asthenopia, squeezing of eyes while studying and while watching television, photophobia and feel like closing the eyes [8-13].However, previous authors did not mention the type and the severity of refractive errors, since there is a paucity of data that highlighted the symptoms of refractive errors, this study was undertaken to determine the symptoms of hypermetropia.

MATERIALS AND METHODS

It is the questionnaire based study; all the subjects were enrolled from L V Prasad eye Institute, Hyderabad. Children who were diagnosed with hyperopia were included in this study. In this study the invigilator does not perform any tests on the patients, who are interested in taking of this study. A simple and brief questionnaire is given to the parents of the child and asked to fill and give it back to the invigilator. The questionnaire comprises of 20 questions, each has ratings on a 5 point scale, with a suitable option for that particular question. Inclusion

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criteria for the study, Children and teenagers aged between 6 to 15 years, Children with low, moderate and high hyperopia, deviations (<30 prism diopters).Exclusion criteria were post operated cases, monocular patients, intellectually challenged, and any associated ocular pathology.

Procedure:

Based on various articles, literature and on the enquiry made, a set of 30 questions was designed. A pilot study was conducted on 25 subjects. Based on the results obtained the questionnaire was validated and a set of 20 questions was designed. The reliability of the questionnaire was analyzed and it was found to be 0.76. (Cronach's alpha). The approval was granted by ethics committee of institutional review board of L.V.Prasad eye Institute and it recommended to) continue the study initially as a pilot study with a larger sample, as this was the first study of its kind. On consulting a biostatican, the sample size was fixed 51. A detailed history of the patient's complaints was taken by the examiner (masked). An oral consent was taken by the examiner before the questionnaire was handed over to the patient's parents/attendent. The invigilator assists the parents while answering the questionnaire. Telephonic interview of the questionnaire also was done for those children who were not directly present in the) clinic by the invigilator, the questions were answered by parents. All the children included in the study underwent a complete eye examination such as distance and near visual acuity tests both unaided and aided were recorded. In addition to this, objective refraction (dry and cycloplegic) followed by subjective assessment, cover test, Hirschberg test, Krimskey test (if there was squint) and complete slit lamp examination to rule out any ocular pathology, dilated fundus examination to rule out retinal and macular pathologies also were carried out during the study.

Analysis: After the data collection, the data was entered into Microsoft excel sheet with scores for each question. The scores were given on a scale of 1-5.The data was analyzed by SPSS software. Correlation and regression co-efficient were used to interpret relation between refractive errors and independent't' test was used to compare the mean difference between the gender.

RESULTS

Table 1: shows the number of subjects who reported the symptoms as always, most of the times, sometimes, rarely and never.

Questions	always	most of the times	sometimes	rarely	never
Does your child complain of blurred vision	9	15	13	8	6
Does he/she complain of aching eye/eye strain	3	17	16	4	11
Does he/she have red and tearing eyes after long hours	2	7	10	9	23
Headache after long hours of reading	7	18	15	2	9
Does he/she rub her eyes often?	2	8	14	11	16
Does he/she squeeze eyes?	7	10	13	7	14

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Does he/she complain of discomfort in seeing light	3	6	10	8	24
Does he/she squint while reading or during strain	2	7	9	4	29
Is the student facing difficulty in board work or school	11	11	11	4	14
Does he/she hold the book too close while reading	19	9	6	4	13
Does he/she wear glasses all the time	1	1	12	11	26
What is the frequency of change in glass prescription	4 months	6 months	9 months	1 year	>1 yr
	12	12	22	3	2
Does he/she prefer outdoor activities	29	11	8	3	0
Does he/she lay down and read	1	4	14	7	25
Does the student have difficulty in tracking one line to the other	1	4	7	9	30
Does he/she copy down incorrect spellings frequently?	2	5	6	11	27
Does he/she prefer sitting close to the black board?	16	6	4	6	19
Does he /she involve in peer group discussion?	38	6	7	0	0
Does he/she copy down notes from fellow bench mates?	0	3	4	8	36
Does he/she tilt head while reading or writing?	4	3	16	2	26

Table 2: shows the significance of the correlation and regression between the refractive errors and each factor (question).

Questions	Co relation	P value	Regression
1	0.38	0.006	0.14
2	0.24	0.9	0.05
3	0.20	0.14	0.04
4	0.16	0.25	0.02
5	0.33	0.017	0.11
6	0.78	0.58	0.006
7	0.15	0.27	0.02
8	-0.01	0.9	0
9	0.38	0.05	0.14
10	0.23	0.94	0.05
11	-0.05	0.72	0.003
12	0.12	0.36	0.01
13	0.43	0.76	0.002
14	0.17	0.23	0.029
15	0.50	0.004	0.25
16	0.30	0.02	0.09
17	0.38	0.05	0.15
18	0.15	0.26	0.02
19	0.30	0.02	0.09
20	0.35	0.01	0.12

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Table 3: shows whether there is a correlation between the genders for each factor and their significance.
1=female 0=male

Questions	Gender	N	Mean	Standard Deviation	Standard error mean	Significance
Q1	F	22	2.9	1.34	0.28	0.08
	M	29	3.51	1.15	0.21	0.09
Q2	F	22	2.95	1.29	0.27	0.94
	M	29	2.93	1.22	0.22	0.94
Q3	F	22	2.22	1.41	0.3	0.65
	M	29	2.06	1.13	0.21	0.66
Q4	F	22	3.40	1.29	0.27	0.40
	M	29	3.10	1.26	0.23	0.40
Q5	F	22	2.59	1.33	0.28	0.30
	M	29	2.24	1.09	0.20	0.32
Q6	F	22	2.81	1.36	0.29	0.88
	M	29	2.75	1.45	0.27	0.88
Q7	F	22	1.90	1.23	0.26	0.27
	M	29	2.31	1.33	0.24	0.27
Q8	F	22	2.13	1.48	0.31	0.79
	M	29	2.03	1.26	0.23	0.79
Q9	F	22	2.50	1.37	0.29	0.02
	M	29	3.48	1.50	0.27	0.01
Q10	F	22	3.18	1.53	0.32	0.38
	M	29	3.58	1.70	0.31	0.37
Q11	F	22	1.63	0.84	0.18	0.24
	M	29	1.96	1.08	0.20	0.23
Q12	F	22	2.18	1.05	0.22	0.09
	M	29	2.68	1.03	0.19	0.09
Q13	F	22	1.59	0.90	0.19	0.37
	M	29	1.82	0.96	0.17	0.37
Q14	F	22	2.00	1.11	0.23	0.91
	M	29	2.03	1.14	0.21	0.91
Q15	F	22	1.36	0.84	0.18	0.01
	M	29	2.1	1.14	0.21	0.01
Q16	F	22	1.5	0.85	0.18	0.02
	M	29	2.24	1.29	0.24	0.01
Q17	F	22	2.36	1.64	0.35	0.05
	M	29	3.31	1.69	0.31	0.05
Q18	F	22	1.18	0.50	0.10	0.07
	M	29	1.55	0.82	0.15	0.05
Q19	F	22	1.31	0.77	0.16	0.22
	M	29	1.62	0.94	0.17	0.21
Q20	F	22	1.63	1.00	0.21	0.03
	M	29	2.41	1.37	0.25	0.02

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DISCUSSION

The symptoms included in this study for hyperopic patients have shown a correlation with the refractive errors with a good statistical significance, and those included - child complaining of blurred vision, rubbing of eyes often, difficulty in board work, difficulty in tracking one line to the other and the tendency to read the same line over and again, copying down incorrect spellings constantly, prefer sitting in the front benches, tilting of head while reading or writing. Other symptoms had a positive correlation with refractive errors, though not statistically significant are complaints of aching or staining of eyes, red and tearing eyes, headache while reading, discomfort in seeing light, getting the books and other materials close to the eyes while reading and writing, preferring outdoor activities, lying down and reading, poor peer group involvement etc. Frequent changing of glasses also minimized the symptoms. Some of the studies done earlier also mentioned the above as significant symptoms [5].

Although it is natural for the hyperopes to keep the reading materials farther away, sometimes it is held excessively close to the eye in an attempt to discern the blurred image simply by enlarging it. Squeezing of eyes often had a weak correlation with refractive error. But this symptom showed good significance according to the study done by EamesTH [10]. Squinting of eyes had a negative correlation with the refractive error in the study. The following symptoms had good correlation between males and females, and they are facing difficulty in board work, difficulty in tracking one line to the other and tendency to read the same line again, copying incorrect spellings constantly, prefers to sit closer to the black board, poor peer group discussion and tilting the head while reading or writing. Current study reveals, children with refractive errors ranging from +0.50 - +2.00Dhad the following symptoms - complaints of blurred vision, eye strain headache, squeezing of eyes and tilting of head while reading or writing. Children with refractive errors ranging between +2.50 to +4.00Dshowed the following symptoms - blurred vision, eyestrain , headache, squeezing of eyes, headache ,discomfort in seeing light, difficulty in seeing the black board. Children with refractive errors ranging from +4.00- +6.00 D revealed the symptoms of blurred vision, eyestrain, headache, constant rubbing of eyes, discomfort in seeing light, squinting of eyes after long hours of reading or near work, difficulty in seeing the black board, copied down notes from fellow bench mates, tilting the head while reading and writing. Children with high refractive errors i.e.>+7.00D had almost all of the above symptoms and few additional symptoms like difficulty in tracking one line to the next, kept the reading materials very close while reading, squinting of eyes, lying down and reading and the above mentioned symptoms are according to the scores allotted for each question with a particular hyperopic error though some of the symptoms did not show statistical significance.

CONCLUSION

The study showed that increased symptoms with increasing refractive errors in higher powers. It also revealed the fact that frequent checks, follow-ups and change of glasses periodically minimized the symptoms. And early detection of hypermetropia by picking up the

symptoms and correcting it (if necessary or keep under observation) would prevent the child from facing various other complications.

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